

11

Inequalities

Basic Practice

1. In each of the following, determine whether the specified value of x is a solution of the given inequality.

(a) $x > 10$; $x = 19$

(c) $x < -12$; $x = -2$

(e) $x \geq 34$; $x = 34$

(g) $5x > 7$; $x = 1.2$

(i) $\frac{x}{2} \geq -5$; $x = -11$

(b) $x < 5$; $x = 5$

(d) $x > -23$; $x = -6$

(f) $4x \leq 20$; $x = -1$

(h) $3x \geq -2$; $x = -\frac{1}{2}$

(j) $\frac{3}{5}x < 9$; $x = -\frac{3}{5}$

2. Solve the following inequalities.

(a) $2x > 12$

(c) $3x < -18$

(e) $6x \geq 27$

(g) $16x \leq 36$

(b) $4x > 32$

(d) $5x < 22.5$

(f) $8x \geq -30$

(h) $24x \leq -64$

3. (a) List all the positive even integers that are smaller than or equal to 20.

(b) Find all possible values of x in each of the following inequalities if x is a positive even integer that is smaller than or equal to 20.

(i) $x < 10$

(iii) $x \leq 9$

(v) $2x < 8$

(vii) $5x \leq 21$

(ii) $x > 12$

(iv) $x \geq 14$

(vi) $3x > 51$

(viii) $4x \geq 71$

4. (a) List all the prime numbers that are smaller than or equal to 30.

(b) Find all possible values of x in each of the following inequalities if x is a prime number that is smaller than 30.

(i) $x < 15$

(iii) $x \leq 17$

(v) $4x < 28$

(vii) $2x \leq 7$

(ii) $x > 23$

(iv) $x \geq 22$

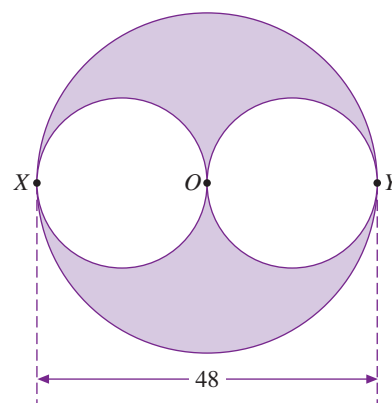
(vi) $5x > 45$

(viii) $3x \geq 43$

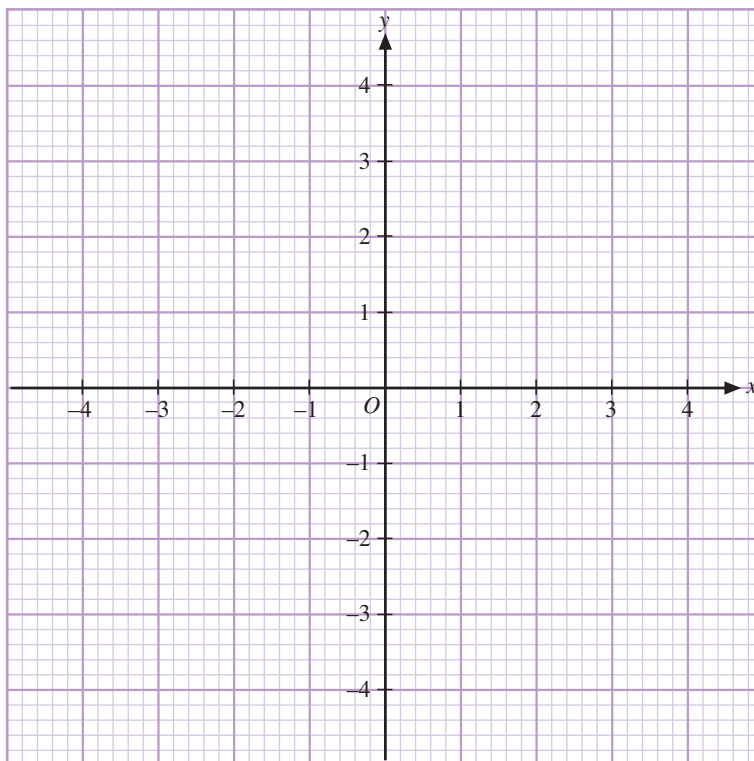
Further Practice

- 11. (a)** A wire is bent into a square of area 81 cm^2 . Find
 (i) the length of a side of the square, (ii) the perimeter of the square.
- (b)** Suppose the same wire is bent into an equilateral triangle. Find the length of a side of the equilateral triangle.
- 12. (a)** The length and width of rectangle $ABCD$ are 25 cm and 32 cm respectively. Find
 (i) the perimeter of the rectangle, (ii) the area of the rectangle.
- (b)** A square is formed when the sides of $ABCD$ are extended. If the length of $ABCD$ is extended by 60%, find
 (i) the length of the square,
 (ii) the percentage increase in the width of the rectangle.
- (c)** Express the area of the square as a percentage of the area of the rectangle.

- 13.** Two small circles are cut out from a large circle of diameter 48 cm. The point O is the center of the large circle and the diameters of the small circles are OX and OY respectively. The points X and Y are on the circumference of the large circle. Find, in terms of π ,
 (a) the area of the resulting plane figure,
 (b) the perimeter of the resulting plane figure.



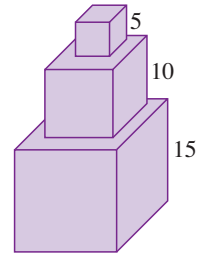
- 14. (a)** Plot each of the following points in the given diagram.
 (i) $A(-3, -4)$, $B(2, -4)$, and $C(4, 1)$
 (ii) $P(-4, 1)$, $Q(-4, -2)$, and $R(2, 3)$
- (b)** Hence, find the area of
 (i) $\triangle ABC$,
 (ii) $\triangle PQR$.
- (c)** The points D and S lie on the x -axis and y -axis respectively. Find the area of
 (i) $\triangle ABD$,
 (ii) $\triangle PQS$.



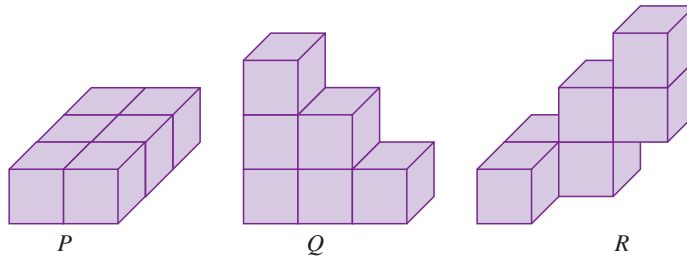
Enrichment

26. In the diagram, three cubical building blocks are stacked up on a table. The lengths of the sides of the blocks are 5 cm, 10 cm, and 15 cm respectively.

- (a) Find the total area of the exposed surfaces of the stack, excluding the contact surface with the table.
- (b) If a cylinder of height 30 cm has volume equal to the total volume of the blocks, find the base radius of the cylinder.

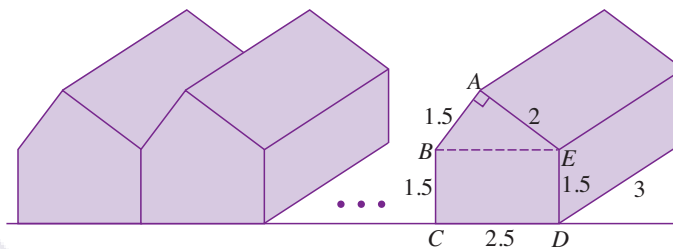


27. Six cubes of side 1 cm are glued together to form a solid. Three possible solids P , Q , and R are shown below.



- (a) Determine the total surface area of solid
 - (i) P ,
 - (ii) Q ,
 - (iii) R .
- (b) Form a solid with the least total surface area.
- (c) Form a solid with the greatest total surface area.

28.



A developer builds a row of identical semi-detached huts along a beach as shown in the diagram above. $ABCDE$ is the cross-section of a hut. $\triangle ABE$ is a right-angled triangle with $AB = 1.5$ m, $AE = 2$ m, and $m\angle BAE = 90^\circ$. $BCDE$ is a rectangle with $CD = 2.5$ m and $BC = 1.5$ m. The length of each hut is 3 m. The thickness of each side wall is 30 cm.

- (a) Find the total surface area of each hut, excluding the floor.
- (b) Find the volume of space of each hut (ignore the thickness of the walls).
- (c) If n huts are in a row, find, in terms of n ,
 - (i) the total roof area,
 - (ii) the total volume of the side walls.

Challenging Practice

30. Let ξ be the set of employees in a company,

$$P = \{\text{employees in the company who earn more than \$2,000 a month}\}$$

and $Q = \{\text{employees in the company who earn at least \$3,000 a month}\}.$

- Describe the sets P' and Q' .
- Describe using ' \subset ', the relationship between
 - P and Q ,
 - P' and Q' .

31. The frequency table below shows the number of dogs owned by a group of children.

Number of dogs	0	1	2	3	4	5
Number of children	7	10	5	5	x	1

- The mean number of dogs owned by each child is 1.6. Form an equation in x and solve it.
 - Hence, find the number of children in the group.
 - A child is randomly selected. Find the probability of selecting a child with more than 3 dogs.
 - A dog is randomly selected. Find the probability of selecting a dog that belongs to a child who has at most 3 dogs.
32. A box contains 200 buttons that are either blue or green. A button is randomly selected from the box.
- Find the number of each type of button if the probability of selecting a blue button is $\frac{11}{25}$.
 - How many blue buttons must be removed from the 200 buttons so that the probability of selecting a green button will become $\frac{8}{13}$?
 - How many blue buttons must be added to the 200 buttons so that the probability of selecting a green button will become $\frac{14}{27}$?
 - When x blue buttons are added and x green buttons are removed from the 200 buttons, the probability of selecting either a blue or green button is the same. Find the value of x .
33. Jeffrey bought a grey (G), a red (R), a blue (B), and a yellow (Y) T-shirt. He also bought a blue (B), a white (W), and a grey (G) pair of jeans. Suppose that Jeffrey randomly matches a shirt with a pair of jeans.
- List all the possible ways of matching a shirt with a pair of jeans.
 - Find the probability of Jeffrey wearing
 - a yellow T-shirt,
 - a white pair of jeans.
 - Let M be the event that Jeffrey matches a shirt with a pair of jeans of the same color. Find $P(M)$ and $P(M')$.