Chapter 4 Proportion and inverse proportion



Proportion and inverse proportion

►Exercises ⇒ P101

1. Letters that can take on a variety of values are called variables							
(2) Suppose there are two variables x and y that change together. When you determine the value of x , if there							
is a unique corresponding value of y , y is a function of x .							
Question Suppose you cut x pieces of 8-cm ribbon from a 1-m ribbon. Letting y be the length of the piece that							
is left uncut, answer the following questions.							
(1) Express y in terms of x . (2) Is y a function of x ?							
Solution (1) (The length of the piece that is left uncut) = (The original length) – (The sum of the lengths of							
the pieces that were cut off), so							
$y = 100 - 8 \times x \longrightarrow y = 100 - 8x$							
When expressing y in terms of x , the term containing a letter is usually placed in front of the term that is							
just a number. For example, $y = -8x + 100$.							
(2) When you determine the value of x , there is a unique corresponding value of y . Therefore, y is a function							
of x.							
Answer (1) $y = -8x + 100$ (2) Yes							

1 Suppose it took *x* hours to walk *y* km at a speed of 5 km per hour. Answer the following questions. $\square(1) \text{ Express } y \text{ in terms of } x.$ $\square(2) \text{ Is } y \text{ a function of } x?$

2 Choose all options indicating that y is a function of x and answer using numbers (i) to (iv).

- \Box (i) The circumference of a square with a side of *x* cm is *y* cm.
 - (ii) A person's height is x cm and his weight is y kg.
 - (iii) You traveled y km by taxi and paid a fare of x yen.
 - (iv) It took y minutes to empty a tank filled with 50 L of water by draining x L per minute.
- **3** Suppose a 30-cm candle burns to become 2 cm shorter per minute. Letting y be the length of the candle x minutes after it was lit, answer the following questions.
- \Box (1) Express *y* in terms of *x*.

 \square (2) Fill in the blanks of the following table.

x	0	1	2	3	4	5	6	
y	30							

 \square (3) Find the value for y when x=13. \square (4) Find the value for x when y=8.



1 Positional relationships between lines and planes The figure on the right shows a solid created by cutting a cuboid with a plane. When AE //BF, answer the following questions.

- \Box (1) How many edges are there that are parallel to edge DC?
- \square (2) Find all edges that are in skewed positions in relation to edge DC.
- \square (3) Find a face that is perpendicular to edge EF.
- \Box (4) Is there any face that is parallel to face AEHD?

2 Prisms and cylinders Find the volume and surface area of the following prisms and cylinder.



3 Cones Answer the following questions about the cone on the right, noting that its bottom face is a circle with radius 8 cm, its height is 6 cm, and its generatrix is 10 cm long.



Η

F

E

- \Box (1) Find the volume of this cone.
- \square (2) Find the central angle of the sector that makes up the side face.
- \square (3) Find the surface area of this cone.

4 Spheres The figure on the right shows one of the solids created by cutting a \Box sphere into 8 equal parts. Find the volume and surface area of this solid.





End-of-chapter problems

 ${\mathfrak l}$ Find the volume of the solid that is created by revolving the shape below once around the axis of revolution line ℓ .





2 Suppose you rolled a cone, whose bottom face has a radius of 5 cm, on a plane with its vertex O as the center, as shown in the figure on the right. When the edge of the cone moved on the dotted line and the cone came back to the starting point, it rotated just three times. Answer the following questions about this cone.



2cm

-2 cm

 $4 \,\mathrm{cm}$

 $\square(2)$ Find its surface area.

 \Box (1) Find the length of its generatrix.

The figure on the right shows a cube whose side is 6 cm. Point P is 3 on side DC. When the volume of quadrangular pyramid F-PABC is $\frac{2}{q}$ of the volume of this cube, find the length of segment PC.



- A Figure 1 on the right shows a triangular prism with AB =3 cm, AC=4 cm, $\angle BAC=90^{\circ}$, BE=6 cm, and AP=BQ =FR=2 cm. Two solids are created by cutting this prism with a plane that passes through three points P, Q, and R. Figure 2 shows the one containing point D. Answer the following questions about the solid in Figure 2.
- \Box (1) Find all edges that are in skewed positions in relation to edge QR.
- $\square(2)$ Find the volume of this solid.

