Circle

From Latin: circus - "ring, a round arena"

A line forming a closed loop, every point on which is a fixed distance from a center point. (see below)

A circle is a type of line. Imagine a straight line segment that is bent around until its ends join. Then arrange that loop until it is exactly circular - that is, all points along that line are the same distance from a center point.

There is a difference between a circle and a disk. A circle is a line, and so, for example, has no area - just as a line has no area. A disk however is a round portion of a plane which has a circular outline. If you draw a circle on paper and cut it out, the round piece is a disk.

Properties of a circle

Center	A point inside the circle. All points on the circle are equidistant (same distance) from the center point.
Radius	The radius is the distance from the center to any point on the circle. It is half the diameter. See Radius of a circle.
Diameter	The distance across the circle. (including the center) The length of any chord passing through the center. It is twice the radius. See Diameter of a circle.
Circumference	The circumference is the distance around the circle. See Circumference of a Circle.
Area	Strictly speaking a circle is a line, and so has no area. What is usually meant is the area of the region enclosed by the circle. See Area enclosed by a circle .

Chord	A line segment linking any two points on a circle. See Chord definition
Tangent	A line passing a circle and touching it at just one point. See Tangent definition
Secant	A line that intersects a circle at two points. See Secant definition

Pi

In any circle, if you divide the circumference (distance around the circle) by it's diameter (distance across the circle), you always get the same number. This number is called Pi and is approximately 3.142. See Definition of pi.

Relation to ellipse

A circle is actually a special case of an ellipse. In an ellipse, if you make the major and minor axis the same length, the result is a circle, with both foci at the center. See Ellipse definition

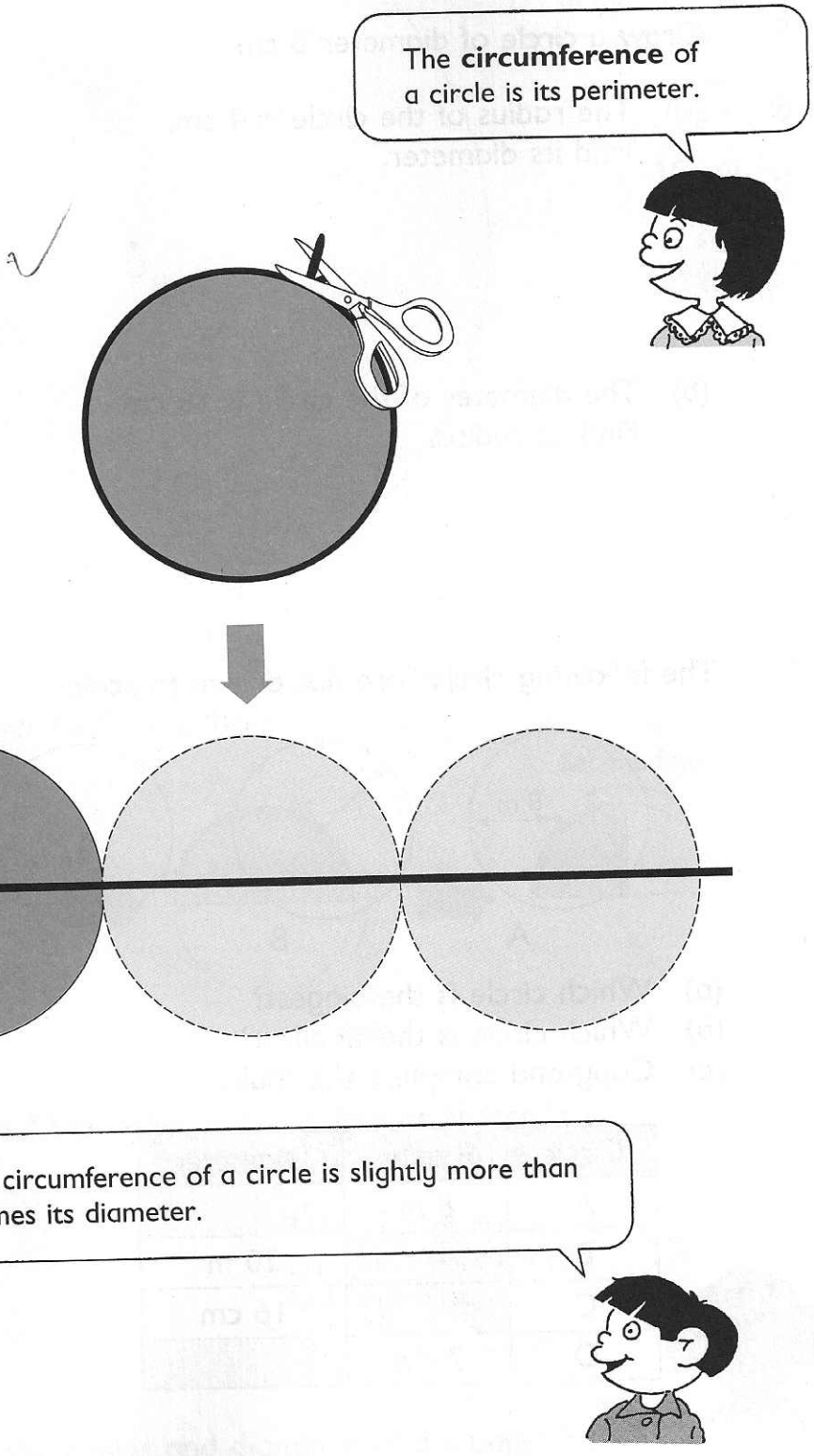
Alternate definitions

There are several definitions of a circle that you may come across. Below are some of the alternative ones.

- *"The set of all points equidistant from the center"*. This assumes that a line can be defined as an infinitely large set of points.
- *"The locus of all points a fixed distance from a given (center) point"*. This definition assumes the plane is composed of an infinite number of points and we select only those that are a fixed distance from the center. A similar definition to the one above. (See locus definition.)

2 Circumference

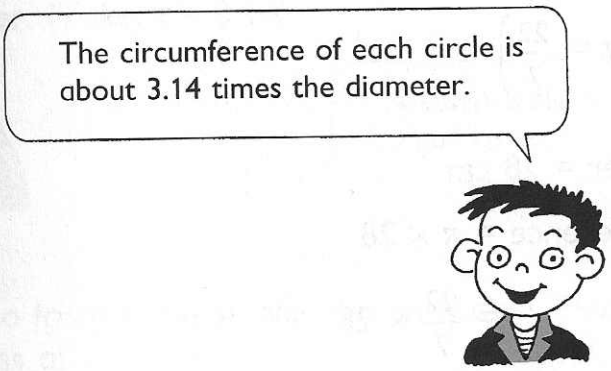
Use a string to measure the **circumference** of a circle like this:



1. Aziz measured the diameter and the circumference of three circles. He recorded the results as follows:

Circle	Diameter	Circumference
A	5 cm	15.7 cm
B	7 cm	22 cm
C	10 cm	31.4 cm

Find the value of **circumference ÷ diameter** for each circle. What do you notice?



The value of **circumference ÷ diameter** is the same for any circle. This value is represented by π.

$\pi \approx 3.14$ or $\frac{22}{7}$

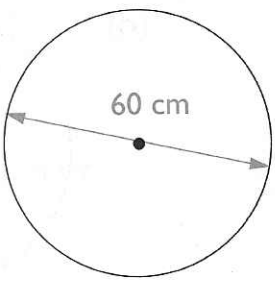
Circumference of circle = $\pi \times$ Diameter

2. The diameter of a hoop is 60 cm. Find its circumference. (Take $\pi = 3.14$)

Circumference = $\pi \times 60$

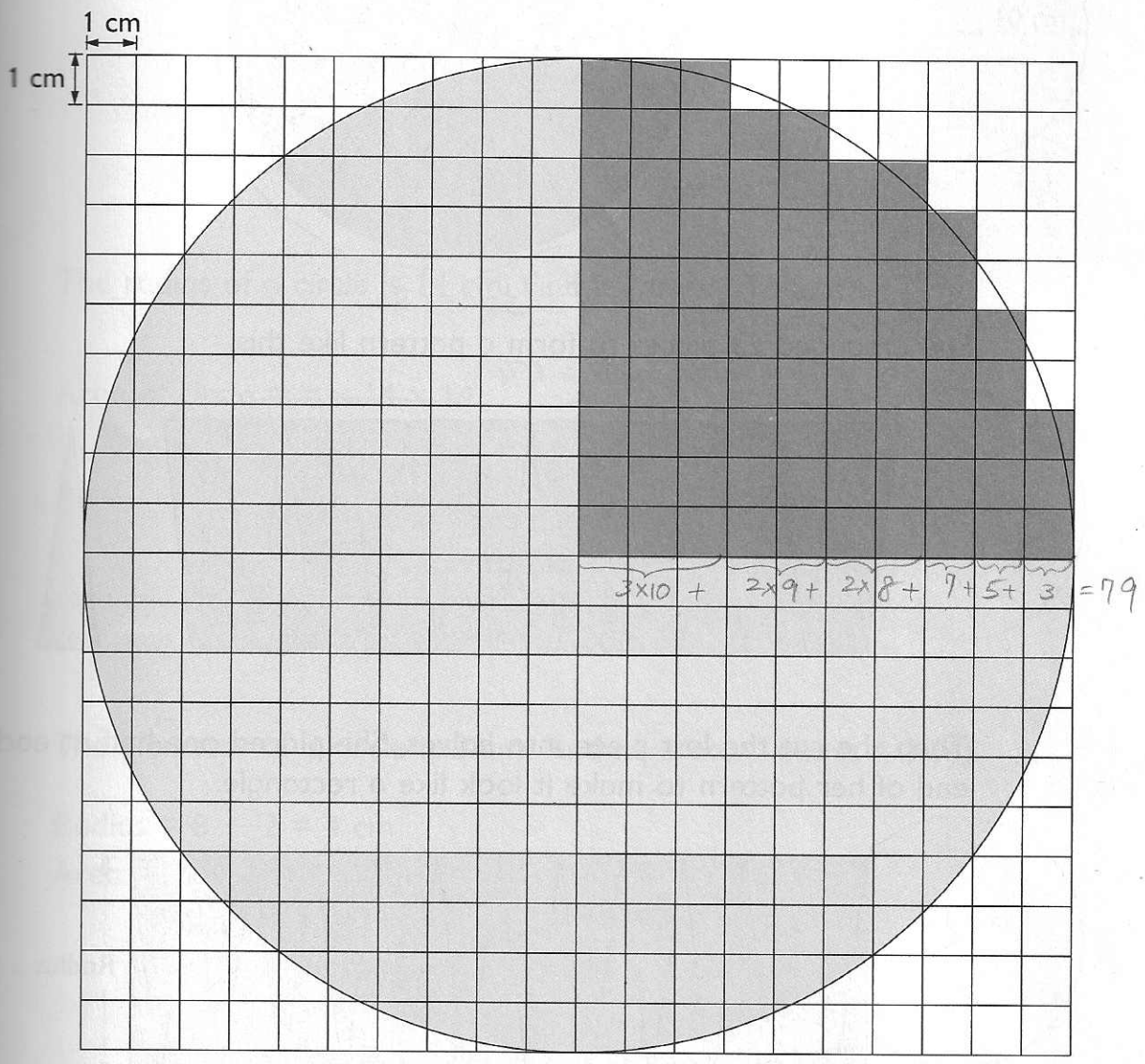
= 3.14×60

= ■ cm



3 Area

The radius of the circle is 10 cm. Estimate its area.



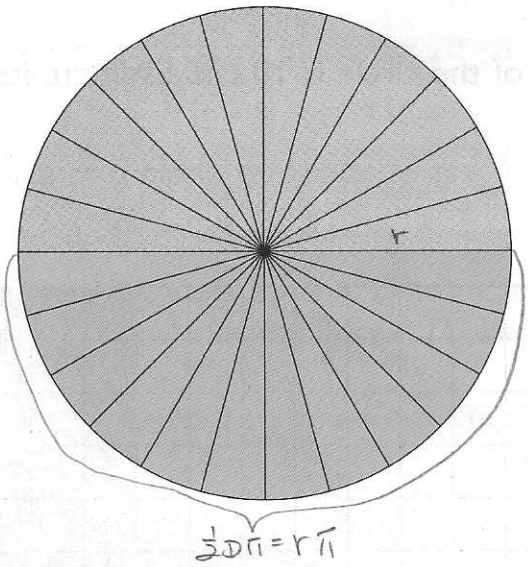
Area of $\frac{1}{4}$ of the circle $\approx$ 79 cm^2

Area of the circle $\approx 4 \times 79$

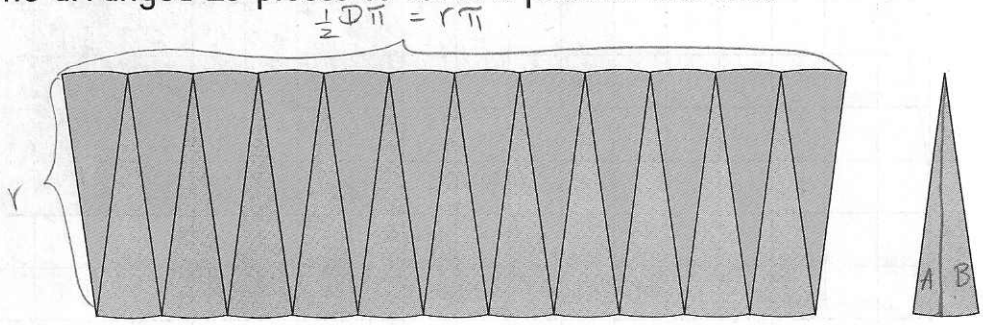
$= 316$ cm^2

$= 3 \times 10 + 2 \times 9 + 2 \times 8 + 7 + 5 + 3$
$= 30 + 18 + 16 + 15 = 61 + 18$
$= 79$

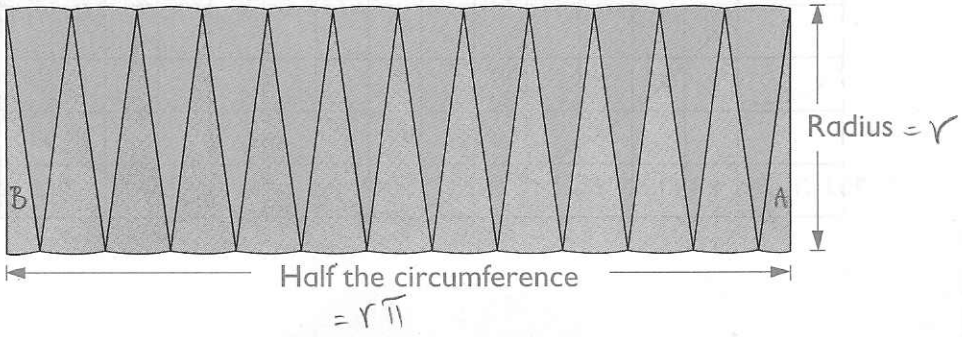
1. Eva cut a circle into 24 equal pieces.

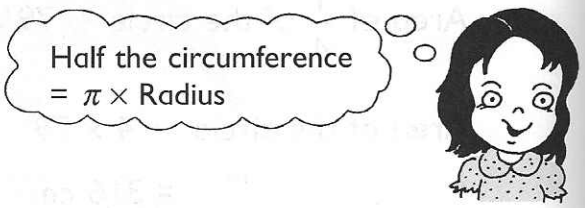


She arranged 23 pieces to form a pattern like this:



Then she cut the last piece into halves. She placed one half at each end of her pattern to make it look like a rectangle.



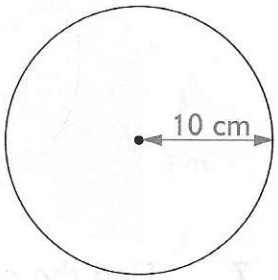


Area of □ r × r = πr^2

Area of circle = π × Radius × Radius

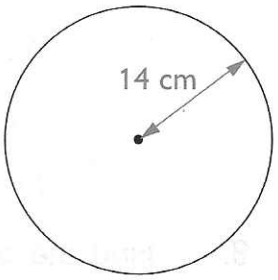
Taking $\pi = 3.14$, find the area of a circle of radius 10 cm.

Area of circle = $\pi \times 10 \times 10$
= $3.14 \times 10 \times 10$
= ■ cm^2



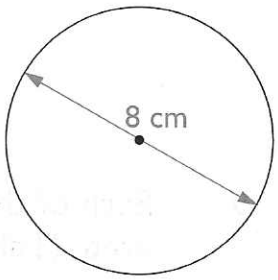
2. The radius of a circle is 14 cm. Find its area. $\left(\text{Take } \pi = \frac{22}{7}\right)$

Area of circle = $\pi \times 14 \times 14$
= $\frac{22}{7} \times 14 \times 14$
= ■ cm^2



3. The diameter of a circle is 8 cm. Find its area. (Take $\pi = 3.14$)

Radius = 8 ÷ 2 = 4 cm
Area = $\pi \times 4 \times 4$
= ■ cm^2



4. Find the area of a circle of radius 7 m. $\left(\text{Take } \pi = \frac{22}{7}\right)$

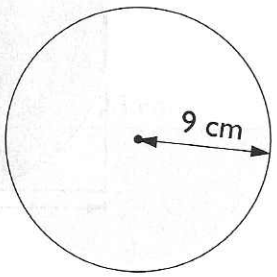
5. Find the area of a circle of diameter 12 m. (Take $\pi = 3.14$)

H/W : text pp. 31-37

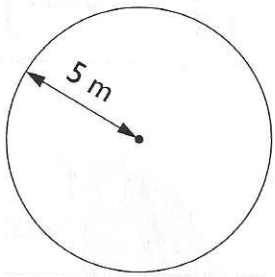
EXERCISE 12

1. Find the area of each of the following circles. (Take $\pi = 3.14$)

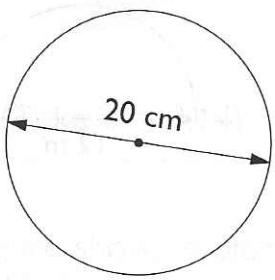
(a)



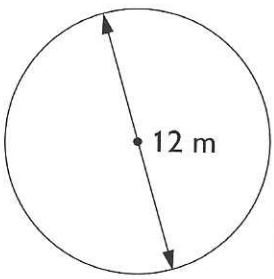
(b)



(c)



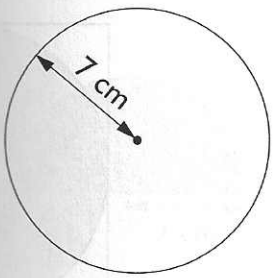
(d)



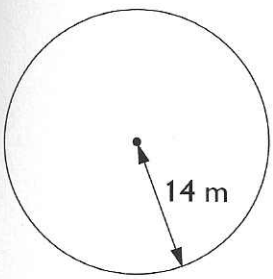
3/25

2. Find the area of each of the following circles. $\left(\text{Take } \pi = \frac{22}{7}\right)$

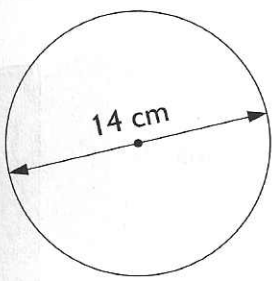
(a)



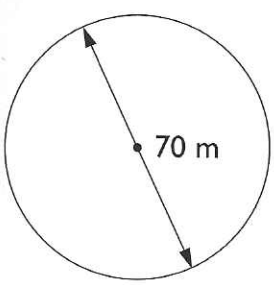
(b)



(c)



(d)



Practice 2B (p. 36) [*1B, p. 20*]

1. 113.04 cm^2
2. 616 m^2
3. (a) 12.56 cm (b) 12.56 cm^2
4. 1.57 m^2
5. 78.5 in^2 [cm^2]
6. 28.26 cm^2; 18.84 cm
7. 154 cm^2

Practice 2C (p. 37) [*1C, p. 21*]

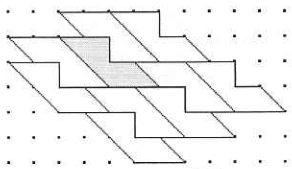
1. (a) 504 cm^2 (b) 88 cm
2. 63.25 m^2; 29.7 m
3. 38.88 cm^2; 36.56 cm
4. 2π m^2; 3π m
5. 12π cm^2

Unit 3 – Graphs
[*Unit 2*]

1 Pie Charts (pp. 38-41) [*pp. 22-25*]

1. (a) plastic (b) 50
   (c) $\frac{2}{5}$ (d) 2
2. (a) $\frac{1}{4}$ (b) \$12,000
   (c) \$1200 (d) 8 : 5
3. (a) toast [*bread*]
   (b) $\frac{1}{20}$ (c) 24
   (d) 25%
4. (a) $\frac{1}{2}$ (b) 25%
   (c) $\frac{1}{8}$ (d) 600
5. (a) swimming (b) 15%
   (c) 60% (d) $\frac{7}{20}$
6. (a) shirts [*blouses*]
   (b) 35%
   (c) 30% (d) \$200

Review A (pp. 42-47) [*pp. 26-31*]

1. Two million, three hundred forty thousand
2. 0.57
3. 2
4. 7
5. 0.09, 0.123, 0.25, 0.5
6. 5.59 kg
7. $\frac{1}{8}$
8. $\frac{3}{8}$
9. 2
10. $\frac{7}{40}$ [*21.49*]
11. 600.93
12. 41.86
13. 17
14. 35,000
15. 67.5
16. (a) 80 min (b) 20 g
17. 8
18. \$200
19. 26
20. 0.32 kg
21. 38 kg
22. 36 kg
23. $\frac{7}{20}$
24. $\frac{4}{9}$
25. \$20
26. 360
27. 4
28. 25%
29. 25%
30. \$28
31. 120 km
32. \$240
33. \$7.15
34. \$860
35. \$960
36. 3 : 4
37. \$2000
38. \$120
39. 12.5 km/h
40. (a) $2\frac{1}{3}$ (b) 36
41. $\frac{3x-2}{2}$ kg
42. 81 cm^2
43. 45.7 cm
44. D
45. 
46. (a) Thursday (b) 5% (c) 37
47. (a) 18% (b) $\frac{1}{5}$ (c) 150

Review B (pp. 48-53) [*pp. 32-37*]

1. 4
2. 1000
3. (a) 10,000 (b) 0.06
4. 36

Exercise 12 [*Exercise 4*]

1. (a) 254.34 cm^2
   (b) 78.5 cm^2
   (c) 314 cm^2 (d) 113.04 cm^2
2. (a) 154 cm^2 (b) 616 m^2
   (c) 154 cm^2 (d) 3850 m^2

Exercise 13 [*Exercise 5*]

1. 314 cm^2
2. 78.5 cm^2
3. (a) 77 cm^2 (b) 308 cm^2

Exercise 14 [*Exercise 6*]

1. (a) 154 cm^2 (b) 115.5 cm^2
   (c) 192.5 cm^2
2. (a) 10π cm^2 (b) 50π cm^2 (c) 4π cm^2
3. 42 cm^2
4. 86 cm^2
5. 25 cm^2

Exercise 15 [*Exercise 7*]

1. (a) 77 cm^2 (b) 196 cm^2
   (c) 273 cm^2
2. (a) 78.5 cm^2 (b) 120 cm^2
   (c) 198.5 cm^2
3. (a) 25.12 cm^2 (b) 40 cm^2
   (c) 65.12 cm^2
4. (a) 77 m^2 (b) 19.25 m^2
   (c) 57.75 m^2
5. (a) 16 cm^2 (b) 3.14 cm^2
   (c) 12.86 cm^2
6. (a) 700 cm^2 (b) 314 cm^2
   (c) 386 cm^2

Exercise 16 [*Exercise 8*]

1. 53.7 m
2. 109.12 cm^2
3. 871 cm^2, 114.2 cm
4. 164.5 cm^2, 87.1 cm

Exercise 17 [*Exercise 9*]

1. (a) 16 (b) 12 (c) 40
   (d) $\frac{1}{5}$ (e) $\frac{1}{10}$
2. (a) Cars (b) 2000 (c) 10,000
   (d) $\frac{2}{25}$ (e) $\frac{8}{25}$
3. (a) 250 (b) 200 (c) 500
   (d) 20% (e) 3
4. (a) $\frac{1}{8}$ (b) \$40 (c) $\frac{1}{2}$
   (d) 25% (e) 1 : 4

Exercise 18 [*Exercise 10*]

1. Motorcycles $\frac{1}{5}$, Cars $\frac{2}{5}$,
   Trucks $\frac{3}{20}$ [*Lorries*]
2. (a) $\frac{3}{8}$ (b) $\frac{1}{4}$ (c) $\frac{1}{8}$
   (d) 150 (e) 100
3. (a) $\frac{1}{2}$ (b) $\frac{2}{9}$ (c) 20
   (d) 30 (e) 10
4. (a) Chocolate (b) $\frac{2}{5}$ (c) 30%
   (d) 20% (e) 160

Exercise 19 [*Exercise 11*]

1. Vacuum cleaner 15%, Fan 10%,
   Oven 35%
2. (a) 15% (b) 25% (c) 40%
   (d) 12 (e) 16
3. (a) 4 (b) 10% (c) 6 kg
   (d) 20 kg (e) 10 kg
4. (a) $\frac{7}{20}$ (b) 25% (c) 15%
   (d) 120 (e) 42

Review 1

1. 10,000
2. 247,000
3. 0.106
4. 2.85
5. (a) 3 (b) 9
6. $\frac{1}{8}$
7. 37.5%
8.* (a) $\frac{4}{5}$ * (b) $\frac{23}{32}$ [*8. 1 h 25 min*]
9. 1.64 m
10. 35%
11. \$680
12. 20 min
13. 40
14. 36
15. 50
16. \$5
17. 116 cm^2
18. 49 cm
19. 957 cm^2
20. 12π cm
21.