

Converting Measurements

3.2

REVIEW: WORKING WITH VARIABLES WITHIN FORMULAS

In this section, you will practise substituting known values into formulas.

In this chapter, you will need to use the following formulas.

$A = \ell w$ Area of a rectangle, where ℓ is the length and w is the width.

$A = \pi r^2$ Area of a circle, where r is the radius and π is the constant, pi.

$A = \frac{1}{2}bh$ Area of a triangle, where b is the length of the base and h is the height.

$A = \pi rs$ Area of the surface of a cone, where r is the radius and s is the slant height.

$C = 2\pi r$ Circumference of a circle, where r is the radius.

Example 1

Sumo is a traditional Japanese martial art. The area of a circular sumo ring, or *dohyo*, is 16.26 m^2 . What is the radius of the ring?

SOLUTION

Use the formula for finding the area of a circle. You are given the area of the circle, so substitute it into the formula and solve for the unknown value, r .

$$A = \pi r^2$$

BUILD YOUR SKILLS

1. Ina is laying turf in a yard measuring 38 ft by 20 ft. What is the yard's area in square feet?
2. A store advertises a circular rug as being 4.9 m^2 . Travis wants a rug to fit a rectangular space that is 2.6 m by 2.6 m. Will this rug fit?
3. You are designing a rectangular label for canned food. The can is 5 cm high, with a diameter of 9 cm. To plan your design, calculate the label's length. (The length is equal to the circle's circumference.)

NEW SKILLS: WORKING WITH DIFFERENT SYSTEMS OF MEASUREMENT

The official system of measurement in Canada is the SI, but the United States uses imperial units. If you are buying products from the United States or are doing business with a US company, you will need to convert between the two systems of measurement.

Below are some common relationships between SI and imperial units of length.

$$1 \text{ inch} \approx 2.54 \text{ centimetres}$$

$$1 \text{ foot} \approx 0.3 \text{ metres}$$

$$1 \text{ yard} \approx 0.9 \text{ metres}$$

$$1 \text{ mile} \approx 1.6 \text{ kilometres}$$

For more details, see page 106 of *MathWorks 10*.

Example 2

Mary is delivering a load of goods from Vancouver, BC, to Seattle, WA, then in Seattle, she is picking up another load to deliver to Albuquerque, NM. The distance from Vancouver to Seattle is 220 km and the distance from Seattle to Albuquerque is 1456 mi. The odometer in Mary's truck records distance in kilometres.

- What is the total distance she will travel, in kilometres?
- If her odometer read 154 987 km when she left Seattle, what did it read when she left Vancouver?
- What will her odometer read when she reaches Albuquerque?

SOLUTION

- Find the distance in kilometres from Seattle to Albuquerque.

$$1 \text{ mi} \approx 1.6 \text{ km}$$

The distance from Seattle to Albuquerque is _____ km.

Add this to the distance from Vancouver to Seattle to find the total distance.

$$\text{_____} + 2330 \text{ km} = \text{_____} \text{ km}$$

Her trip will be about _____ km.

- Subtract the distance she travelled from the odometer reading.

$$\text{_____} - \text{_____} = \text{_____}$$

Her odometer read _____ when she left Vancouver

- Add the distance from Seattle to Albuquerque to the odometer reading.

$$\text{_____} + \text{_____} = \text{_____}$$

Her odometer should read about _____ when she reaches Albuquerque.

BUILD YOUR SKILLS

4. Suzanne purchased tiles for her patio that are 8" by 4". She measured her patio in metres and wants to convert the tile dimensions to SI units. What are the dimensions of the tiles in centimetres?

5. Benjamin owns an older American truck. The odometer shows distance travelled in miles. On a recent trip to deliver produce for his employer, he drove 1564 mi. His employer pays him \$0.89/km for the use of his own truck. How much will he be reimbursed for the use of his truck for the trip?

6. Marnie owns a carpet store and sells hallway runners for \$9.52/linear foot.

a) How much is this per linear yard?

b) How much is this per linear metre?

c) Ralph needs 3.9 m of the runner for his hallway. How much will it cost?

Example 3

Rebecca is planning to install sod in her backyard, which is 18.2 m by 9.8 m. If sod costs $\$0.28/\text{ft}^2$, how much will it cost to sod the backyard?

SOLUTION

Change the measurements of the backyard to feet, and then find the area.

Her yard is approximately _____ ft long.

Similarly, change 9.8 m (980 cm) to feet.

Her yard is approximately _____ ft wide.

Calculate the area of her backyard. The area of a rectangle is calculated by multiplying the length by the width.

$$A = \ell w$$

She will need approximately _____ square feet of sod at $\$0.28/\text{ft}^2$.

$$\text{_____} \times \$0.28 = \text{_____}$$

It will cost about _____ to sod her backyard.

BUILD YOUR SKILLS

7. You could have solved Example 3 by determining the cost of the sod per square metre. Answer the question using this method. Is your answer the same? Why or why not?
8. Kuldeep has been hired to lay terracotta tiles on a floor that measures 4.2 m by 3.8 m. The tiles are 9" by 9" and come in boxes of 12.
- a) How many boxes must he buy? (He cannot buy a partial box.)
- b) If the tiles cost \$18.95 per box, how much will the tiles cost in total?
9. Toula calculates the cost of cementing the bottom and sides of a circular pond. When all costs are considered, the job will cost \$175.85 per square metre of finished area. If the pond has a radius of 3 feet and a depth of 2 feet, how much will she charge for the job?

PRACTISE YOUR NEW SKILLS

1. Juan is a picture framer. He is framing a picture that is 24 inches by 32 inches with a frame that is 2.5 inches wide. What is the outer perimeter of the framed picture:
 - a) in inches?
 - b) in feet and inches?
 - c) in yards, feet, and inches?

2. Charlie drove from Calgary to Saskatoon, which is a distance of 620 km. How far is this in miles?

3. A school custodian must mark off a field that is 150 ft by 85 ft. His tape measure is marked in metres. What are the dimensions of the field in metres (to the nearest tenth of a metre)?

4. Jeff knows that his semi-trailer truck is 3.2 m high. A tunnel is marked as “Max height: 10'6”.” Will Jeff’s truck fit through the tunnel?

5. Carla needs 3.5 m of cloth. If the cloth she wants to purchase costs \$9.78/yd, how much will the cloth cost?

6. Ari, a gardener, estimates the cost of seeding a 150 m by 210 m area with grass seed. He needs 3 pounds of seed per 100 000 square feet. How many pounds of seed will Ari need?

7. A room measures 12'8" by 10'9". Carpeting costs \$45.98/m². A customer will have to purchase 10% more carpeting than floor area due to waste and he cannot purchase partial square metres. What is the minimum cost of the carpeting?