Math 10 — Unit 3 Quick Check

Mr. Merrick · October 9, 2025

A. Multiple Choice

1. Which is closest to the thickness of a standard credit card?

(A) 0.76 mm (B) 0.076 mm (C) 7.6 mm (D) 76 μm

Solution: A

2. Convert 3.25 km to inches (use 1 in = 2.54 cm).

(A) 1.28×10^5 in (B) 1.02×10^5 in (C) 3.25×10^4 in (D) 8.53×10^3 in

Solution: A

3. The area of a circle with diameter 2.00 in expressed in cm^2 is closest to

(A) 3.14 cm^2 (B) 20.3 cm^2 (C) 10.2 cm^2 (D) 6.45 cm^2

Solution: B

4. Convert 2.4 m^2 into cm^2.

(A) 240 cm^2 (B) 24,000 cm^2 (C) 2400 cm^2 (D) 240,000 cm^2

Solution: B

5. A rectangular box measures 12 in $\times$ 8 in $\times$ 5 in. Its volume in litres is closest to

(A) 7.9 L (B) 3.9 L (C) 4.9 L (D) 7.0 L

Solution: A

6. Which metric unit is most reasonable to measure the thickness of a human hair?

(A) Millimetre (B) Micrometre (C) Nanometre (D) Centimetre

Solution: B

7. Convert 1 mile^2 into km^2 (1 mi = 1.609 km).

(A) 1.61 km^2 (B) 2.59 km^2 (C) 3.22 km^2 (D) 1.00 km^2

Solution: B

8. The lateral surface area of a cylinder of radius $r = 3$ and height $h = 10$ is

(A) 30π (B) 60π (C) 90π (D) 120π

Solution: B

9. The volume of a cone of radius r and height $3r$ is

(A) πr^3 (B) $3\pi r^3$ (C) $\frac{1}{3}\pi r^3$ (D) πr^2

Solution: A

10. A sphere has volume 36π. Its surface area is

(A) 36π (B) 48π (C) 81π (D) 144π

Solution: A

11. A measurement recorded as 12.30 cm was made with a ruler marked in millimetres. How many significant figures does it have, and to what precision is it recorded?

(A) 3 s.f.; nearest 0.1 cm (B) 4 s.f.; nearest 0.01 cm (C) 4 s.f.; nearest 0.1 cm (D) 5 s.f.; nearest 0.01 cm

Solution: B

12. Which unit would be most appropriate for the *area* of a classroom floor?

(A) mm^2 (B) cm^2 (C) m^2 (D) km^2

Solution: C

C. Written Response

Show your work and include units.

1. Convert 45 km/h to m/s.

Solution:

$$45\ \tfrac{\text{km}}{\text{h}} \times \tfrac{1000\ \text{m}}{1\ \text{km}} \times \tfrac{1\ \text{h}}{3600\ \text{s}} = 12.5\ \text{m/s}$$

2. A cylinder has radius 7.5 cm and height 20 cm. Find its total surface area.

Solution:

$$S = 2\pi r^2 + 2\pi rh = 2\pi(7.5)^2 + 2\pi(7.5)(20) = 412.5\pi \approx 1.296 \times 10^3\ \text{cm}^2.$$

3. The volume of a sphere is 288π cm^3. Find its radius.

Solution:

$$\tfrac{4}{3}\pi r^3 = 288\pi \ \Rightarrow\ r^3 = 216 \ \Rightarrow\ r = 6\ \text{cm}.$$

4. Convert 15 ft^3 into litres. (Use 1 ft = 0.3048 m, 1 m^3 = 1000 L).

Solution:

$$15(0.3048)^3 \cdot 1000 \approx 4.25 \times 10^2\ \text{L}$$

5. A pyramid has square base 12 m and height 15 m. Find its volume.

Solution:

$$V = \tfrac{1}{3}bh = \tfrac{1}{3}(12^2)(15) = 720\ \text{m}^3.$$

6. A cylindrical water tank of diameter 3.6 m and height 4.5 m is filled to 80% of capacity. Find the volume of water in litres.

Solution: Full volume $= \pi r^2 h = \pi(1.8^2)(4.5) = 45.8$ m^3. Water $= 0.8 \times 45.8 = 36.7$ m^3 $\approx 3.67 \times 10^4$ L.

7. A wooden beam is cut into a square prism 20 cm long with diagonal cross-section 10 cm. Find its volume.

Solution: Square side $= \frac{10}{\sqrt{2}} = 7.07$ cm. Volume $= 20(7.07^2) \approx 1.00 \times 10^3$ cm^3.

8. The Great Pyramid of Giza has base length 230 m and original height 146 m. Approximate its volume in cubic kilometres.

Solution: $V = \frac{1}{3}(230^2)(146) \approx 2.57 \times 10^6$ m$^3 = 2.57 \times 10^{-3}$ km^3.

9. A steel sphere of radius 5 cm is melted and recast into cylindrical rods of radius 0.5 cm and length 20 cm. How many rods can be made?

Solution: Sphere volume $= \frac{4}{3}\pi(125) = 523.6$ cm^3. Cylinder volume $= \pi(0.5^2)(20) = 15.7$ cm^3. Ratio ≈ 33 rods (whole rods).

10. A cube of edge x cm has the same surface area as a sphere of radius $r = 6$ cm. Find x.

Solution: Cube area $= 6x^2$, sphere area $= 4\pi r^2 = 144\pi$. Equate: $6x^2 = 144\pi \Rightarrow x = \sqrt{24\pi} \approx 8.68$ cm.

11. A cone and a hemisphere share the same base radius r and equal volumes. Find the ratio of the cone's height h to r.

Solution: $\frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^3 \Rightarrow h = 2r$.

12. A right circular cylinder of radius 40 cm and length 1.5 m lies on its side and is filled to half its depth. Derive a formula (in terms of r, L, θ) for the volume of liquid, and then evaluate numerically.

Solution: For fill depth h, the cross-sectional area is the circular segment $A = \frac{r^2}{2}(\theta - \sin\theta)$ with $\theta = 2\arccos\left(\frac{r-h}{r}\right)$. At half depth ($h = r$), $\theta = \pi$, so $A = \frac{\pi r^2}{2}$. Volume $= L \cdot A = \frac{\pi r^2 L}{2}$. With $r = 40$ cm and $L = 150$ cm: $V = \frac{\pi(40)^2(150)}{2} \approx 3.77 \times 10^5$ cm$^3 \approx 3.77 \times 10^2$ L.

13. A decorative garden light consists of a hemisphere (radius 9 cm) mounted on a right circular cylinder (radius 9 cm, height 18 cm). Find the total exterior surface area (exclude the join) and the total volume.

Solution: Surface area $= 2\pi rh$ (cylinder curved) $+ 2\pi r^2$ (hemisphere) $= 2\pi(9)(18) + 2\pi(9)^2 = 324\pi + 162\pi = 486\pi$ cm$^2 \approx 1.53 \times 10^3$ cm^2. Volume $= \pi r^2 h + \frac{2}{3}\pi r^3 = \pi(9)^2(18) + \frac{2}{3}\pi(9)^3 = 1458\pi + 486\pi = 1944\pi$ cm$^3 \approx 6.11 \times 10^3$ cm^3.

14. The area of an irregular garden bed is estimated by decomposing it into a 6.0 m $\times$ 4.0 m rectangle and a semicircle of diameter 6.0 m. State the area to an appropriate number of significant figures and comment on the effect of measurement precision on your result.

Solution: Rectangle $= 24.0$ m^2. Semicircle with $r = 3.0$ m has area $\frac{1}{2}\pi r^2 = \frac{1}{2}\pi(9.0) = 14.137\ldots$ m^2. Total ≈ 38.1 m^2. Given inputs to 2–3 s.f., report 38.1 m^2 (3 s.f.). Uncertainty in the ± 0.1 m measurements changes area by roughly a few percent.