F_WORKSHEET # 005 | Australian Curriculum Year 7 Mathematics | FWM7T3U5

ACACIA TUTORING

Equations, Inequalities, Perimeter, Area, and Volume

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Free and always will be!

Focus A set of questions and solutions for Year 7 students on Equations, Inequalities, Perimeter, Area, and Volume, tailored to the Australian Curriculum:

1. Basic Equations

a) Solve the equation $x + 5 = 9$.

b) Solve for y in the equation $3y = 15$.

2. More Complex Equations

a) Solve $2a - 3 = 7$.

b) Solve $4b + 6 = 2b$ **.**

3. Inequalities

a) Solve the inequality $x + 2 < 5$ **.**

b) Solve for y **in** $3y - 1 \geq 8$ **.**

4. Word Problems

a) If 4 times a number is 16 , what is the number?

b) The sum of twice a number and 7 is less than 13. Write this as an inequality and solve it.

5. Visualising Inequalities on a Number Line

a) Graph the solution to $x \geq -2$ on a number line.

b) Show $1 < y \leq 4$ on a number line.

6. Combining Equations and Inequalities

Solve and then compare $2x + 1 = 7$ with $2x + 1 < 7$.

7. Perimeter

a) Calculate the perimeter of a rectangle with length $8\,cm$ and width $5\,cm$.

b) Find the perimeter of a triangle with sides $6\,cm$, $8\,cm$, and $10\,cm$.

8. Area

a) Determine the area of a square with side length $7\,cm$.

b) Calculate the area of a rectangle with length $12\,m$ and width $5\,m$.

9. Composite Shapes

a) A shape is made up of a rectangle ($10\,cm$ by $5\,cm$) with a semi-circle (diameter $10\,cm$) on one end. Find its total area.

b) Find the perimeter of the shape described above.

10. Volume

a) Calculate the volume of a rectangular prism with dimensions $3\,cm$, $4\,cm$, and $5\,cm$.

b) Find the volume of a cube with side length $6\,cm$.

11. Real-World Applications

a) A garden bed is $8\,metres$ long and $2\,metres$ wide. How much fencing is needed to go around it?

b) If a fish tank is $1.5\,m$ long, $0.5\,m$ wide, and $0.7\,m$ deep, what is its volume in $litres$?
($1\,m^3 = 1000\,L$).

Solutions

1a.

Subtract 5 from both sides:

$$x+5-5=9-5$$
$$x=4.$$

b.

Divide both sides by 3:

$$\frac{3y}{3}=\frac{15}{3}$$
$$y=5.$$

2a.

Add 3 to both sides:

$$2a-3+3=7+3$$
$$2a=10$$

Then divide by 2:

$$\frac{2a}{2}=\frac{10}{2}$$
$$a=5.$$

b.

Subtract $2b$ from both sides to isolate b:

$$4b-2b+6=2b-2b,$$
$$2b+6=0$$

Subtract 6 from both sides:

$$2b+6-6=0-6,$$
$$2b=-6$$

Divide by 2:

$$\frac{2b}{2}=\frac{-6}{2},$$
$$b=-3.$$

3a.

Subtract 2 from both sides:

$$x+2-2<5-2,$$
$$x<3$$

b.

Add 1 to both sides:

$$3y - 1 + 1 \geq 8 + 1,$$
$$3y \geq 9$$

Divide both sides by 3 (remember, when dividing or multiplying an inequality by a negative number, you would flip the sign, but here we divide by a positive number):

$$\frac{3y}{3} \geq \frac{9}{3},$$
$$y \geq 3.$$

4a.

Let the number be x:

$$4x = 16$$

Divide both sides by 4:

$$x = \frac{16}{4},$$
$$x = 4$$

b)

Let the number be y:

$$2y + 7 < 13$$

Subtract 7 from both sides:

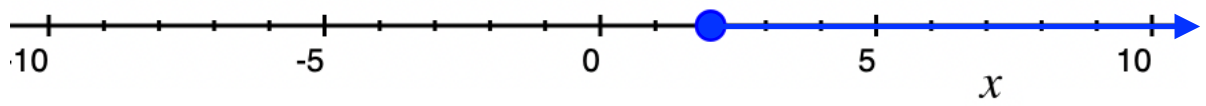
$$2y < 6$$

Divide by 2:

$$y < 3.$$

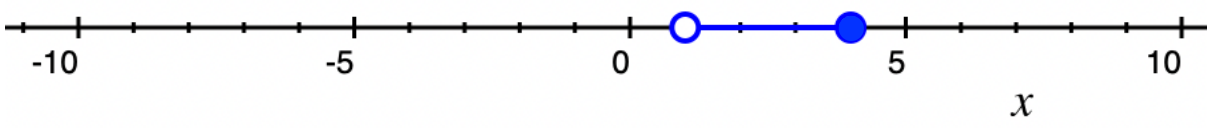
5a.

Use a closed circle at 2 (since it's included) and then draw in an arrow pointing to the right.



b.

Use an open circle at 1 (since it's not included) and a closed circle at 4 (since it is included), then place a line between these two points.



6.

For the equation $2x + 1 = 7$:

Subtract 1 from both sides:

$2x = 6$

Divide by 2:

$x = 3$

For the inequality $2x + 1 < 7$:

Subtract 1 from both sides:

$2x < 6$

Divide by 2:

$x < 3$

Comparison: $x = 3$ (from the equation) is not included in the solution set of $x < 3$ (from the inequality).

7a.

Perimeter P of a rectangle is given by:

$P = 2 \times (\text{length} + \text{width})$
$P = 2 \times (8 + 5)$
$= 2 \times 13$
$= 26\,cm$.

b.

Perimeter P of a triangle is the sum of its sides:

$P = 6 + 8 + 10$
$= 24\,cm$.

8a.

Area A of a square is given by:
$A = \text{side}^2$,
$A = 7^2$
$= 49\,cm^2$.

b.

Area A of a rectangle is given by:
$A = \text{length} \times \text{width}$
$A = 12 \times 5$
$= 60\,m^2$.

9a.

Area of the rectangle: $10 \times 5 = 50\,cm^2$.

Radius of the semicircle is half the diameter, so $r = 5\,cm$.

Area of a full circle would be πr^2, but it's a semicircle:

$$A_{\text{semicircle}} = \frac{1}{2} \times \pi \times \text{radius}^2$$
$$= \frac{1}{2} \times \pi \times 5^2$$
$$= \frac{1}{2} \times \pi \times 25$$
$$\approx \frac{1}{2} \times 78.54$$
$$= 39.27 cm^2.$$

Total Area = Area of rectangle + Area of semicircle:

$$= 50 + 39.27$$
$$\approx 89.27\,cm^2.$$

b.

Perimeter includes two sides of the rectangle ($10\,cm + 5\,cm$), the straight part of the semicircle ($10\,cm$), and the curved part of the semicircle (half the circumference of a circle with radius $5\,cm$):

Circumference of full circle $= 2\pi r$
$= 2\pi \times 5$
$\approx 31.42cm;$

half is approximately $15.71cm$.

Total Perimeter:

$$= 10 + 5 + 10 + 15.71$$
$$\approx 40.7\,cm.$$

10a.

Volume V of a rectangular prism (cuboid) is $V =$ length $\times$ width $\times$ height :

$$V = 3 \times 4 \times 5$$
$$= 60\,cm^3.$$

b.

Volume V of a cube is given by $V = \text{side}^3$:

$$V = 6^3$$
$$= 216\,cm^3.$$

11a.

Perimeter of the garden bed:

$$\begin{aligned} P &= 2 \times (8 + 2) \\ &= 2 \times 10 \\ &= 20\,m\,. \end{aligned}$$

b.

Volume in cubic metres:

$$1.5 \times 0.5 \times 0.7 = 0.525\,m^3\,.$$

Convert to litres:

$$\begin{aligned} 1\,m^3 = 1000\,L \;\rightarrow\; 1000\,L\,/m^3 \\ &= 0.525\,\cancel{m^3} \times 1000\,\frac{L}{\cancel{m^3}} \\ &= 0.525 \times 1000\,L \\ &= 525\,L\,. \end{aligned}$$

Additional Notes for Teachers

Learning Outcomes:
Students should be able to solve basic equations and inequalities, understand the difference between them, and apply these skills to contextual problems. Students should understand how to calculate perimeter, area, and volume for basic shapes and apply these concepts to more complex or real-world scenarios.

Teaching Strategies:
Use physical models or digital tools for visualising equations and inequalities. Encourage students to describe solutions in words before writing them mathematically. Use physical models or digital tools to help visualise these concepts. Engage students with practical activities like designing a room or a garden.

Assessment:
Evaluate through a mix of direct problem-solving, application in word problems, and interpretation of results on number lines or graphs. Assess through problems that require students to choose the correct formula, apply it, and interpret the result in context.

Resources:
Use algebra tiles for solving equations, and interactive whiteboards or apps for graphing inequalities. Consider using geoboards for area, 3D models for volume, or software that allows students to manipulate shapes to see how changes affect perimeter, area, and volume.

This set of questions aligns with the Australian Curriculum for Year 7, focusing on understanding, fluency, problem-solving, and reasoning in equations, inequalities, perimeter, area, and volume..