Exercise7F: Solutions

1 a AAA

$$\frac{x}{5} = \frac{9}{4}$$
$$x = \frac{9 \times 5}{4} = 11.25 \text{ cm}$$

b AAA

Note that E corresponds with B, so x corresponds with 14 cm.

$$\frac{x}{14} = \frac{10}{12}$$
$$x = \frac{10 \times 14}{12} = 11\frac{2}{3} \text{ cm}$$

c AAA

$$\frac{x}{2} = \frac{6}{4}$$
$$x = \frac{6 \times 2}{4} = 3 \text{ cm}$$

d AAA

Note that Q corresponds with B and R corresponds with C, so x corresponds with 6 cm.

$$\frac{x}{6} = \frac{10}{8}$$
$$x = \frac{10 \times 6}{8} = 7.5 \text{ cm}$$

2 a AAA

$$\frac{x+12}{12} = \frac{24}{16} = \frac{3}{2}$$
$$2x + 24 = 36$$
$$2x = 12$$
$$x = 6 \text{ cm}$$

b AAA

$$\frac{x+2}{2} = \frac{5}{3}$$
$$3x + 6 = 10$$
$$3x = 4$$
$$x = 1\frac{1}{3} \text{ cm}$$

c AAA

$$\frac{x+8}{x} = \frac{8}{2} = 4$$
$$x + 8 = 4x$$
$$3x = 8$$
$$x = 2\frac{2}{3} \text{ cm}$$

d AAA

$$\frac{x+1.5}{x} = \frac{12}{10} = \frac{6}{5}$$
$$5x + 7.5 = 6x$$
$$x = 7.5 \text{ cm}$$

3
$$\frac{AC}{14} = \frac{15}{12} = \frac{5}{4}$$
$$AC = \frac{5 \times 14}{4} = 17.5 \text{ cm}$$
$$\frac{AE + 4}{AE} = \frac{5}{4}$$
$$4AE + 16 = 5AE$$
$$AE = 16 \text{ cm}$$
$$AB = AE + EB$$
$$= 20 \text{ cm}$$

4
$$\frac{\text{tree}}{33} = \frac{30}{224} = \frac{15}{112}$$
$$\text{Tree height} = \frac{15 \times 33}{112} = 4.42 \text{ m}$$
Note: It is valid to leave the measurements of the stick and its shadow in cm, as you are comparing the ratio of measurements with the same units.

5
$$\frac{h}{15} = \frac{20}{40} = \frac{1}{2}$$
$$h = \frac{15}{2} = 7.5 \text{ m high}$$

6
$$\frac{h}{300} = \frac{1}{20}$$
$$h = \frac{300}{20} = 15 \text{ m high}$$

7
$$\frac{CY}{45} = \frac{15}{30} = \frac{1}{2}$$
$$CY = \frac{45}{2} = 22.5 \text{ m}$$

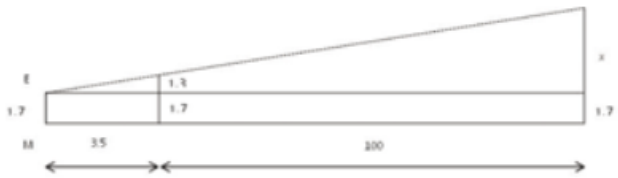
8
$$\frac{h}{32} = \frac{2}{6.2}$$
$$h = \frac{64}{6.2} = 10\frac{10}{31} \text{ m high}$$

9
$$\frac{x}{4} = \frac{20 - x}{8}$$
$$\frac{2x}{8} = \frac{20 - x}{8}$$
$$2x = 20 - x$$
$$3x = 20$$
$$x = \frac{20}{3} = 6\frac{2}{3} \text{ cm high}$$

10 Let x be the height of A above the 80 cm leg of the table.
$$\frac{x}{30} = \frac{12}{100}$$
$$h = \frac{12 \times 30}{100} = 3.6$$
$$\text{Height} = 80 \text{ cm} + 3.6 \text{ cm}$$
$$= 83.6 \text{ cm}$$

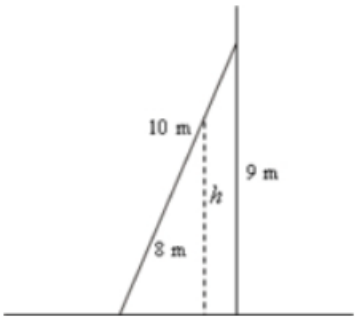
11
$$\frac{x}{1.3 - x} = \frac{1.5}{0.8} = \frac{15}{8}$$
$$8x = 19.5\,x - 15\,x$$
$$23\,x = 19.5$$
$$x = \frac{19.5}{23} = \frac{39}{46} \text{ m}$$

12



$$\frac{x}{103.5} = \frac{1.3}{3.5}$$
$$x = \frac{1.3 \times 103.5}{3.5}$$
$$= \frac{269.1}{7}$$
$$= \frac{260}{7} \approx 37.1$$
$$\text{Height} = \frac{269.1}{7} + 1.7$$
$$= \frac{269.1 + 11.9}{7}$$
$$= \frac{281}{7}$$
$$= 40\frac{1}{7} \text{ m}$$

13



$$\frac{h}{8} = \frac{9}{10}$$
$$h = \frac{72}{10} = 7.2 \text{ m high}$$

14 Taking the heights above the spotlight,

$$\frac{h - 0.6}{8} = \frac{0.5}{3} = \frac{1}{6}$$
$$h - \frac{6}{10} = \frac{8}{6} = \frac{4}{3}$$
$$h = \frac{4}{3} + \frac{3}{5}$$
$$= \frac{20 + 9}{15}$$
$$= 1\frac{14}{15} \text{ m high}$$

15a Vertically opposite angles at C are equal:
$\angle B = \angle D = 90^\circ$

The third angles in the triangle must be equal: $\angle A = \angle E$

$\therefore \quad \triangle ABC \sim \triangle EDC$

b
$$\frac{x}{4} = \frac{5}{2}$$
$$x = \frac{20}{2} = 10$$

c $y^2 = 2^2 + 4^2$

$= 4 + 16 = 20$

$y = \sqrt{20}$

$= \sqrt{4 \times 5} = 2\sqrt{5}$

$z^2 = 10^2 + 5^2$

$= 100 + 25 = 125$

$z = \sqrt{125}$

$= \sqrt{25 \times 5} = 5\sqrt{5}$

d $y : z = 2\sqrt{5} : 5\sqrt{5}$

$= 2 : 5$

$ED : AB = 2 : 5$

$\therefore \quad y : z = ED : AB$

16 $\dfrac{a+12}{12} = \dfrac{10}{7}$

$a + 12 = \dfrac{120}{7}$

$a = \dfrac{120}{7} - 12$

$= \dfrac{36}{7} = 5\dfrac{1}{7}$

17 $\dfrac{h}{3} = \dfrac{1.8}{0.76}$

$h = \dfrac{1.8 \times 3}{0.76} \approx 7.11 \text{ m}$

18 In $\triangle TRN, \angle TRN = 90^\circ - \angle T$

In $\triangle RST$, $\angle S = 90^\circ - \angle T$

$\angle TRN = \angle S$

$\angle SRN = \angle T$

$\triangle TRN \sim \triangle TSR$

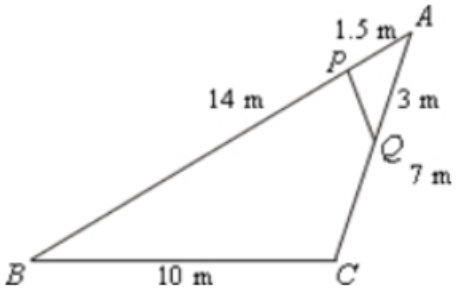
$\dfrac{NT}{RT} = \dfrac{RT}{ST}$

$= \dfrac{4}{10} = \dfrac{2}{5}$

$\dfrac{NT}{4} = \dfrac{2}{5}$

$NT = \dfrac{2 \times 4}{5} = 1.6 \text{ m}$

19



In $\triangle APQ$ and $\triangle ACB$,

$\dfrac{AQ}{AB} = \dfrac{3}{14}$

$\dfrac{AP}{AC} = \dfrac{1.5}{7} = \dfrac{3}{14}$

$\therefore \quad \dfrac{AQ}{AB} = \dfrac{AP}{AC}$

$\angle A$ is common to both triangles.

$$\triangle APQ \sim \triangle ACB$$

$$\frac{PQ}{BC} = \frac{AQ}{AB}$$

$$\frac{PQ}{10} = \frac{3}{14}$$

$$PQ = \frac{30}{14} = 2\frac{1}{7}\ \text{m}$$

20 Note that the three triangles are all similar, as shown in **Q** . 18.

$$\frac{x+4}{6} = \frac{6}{4} = \frac{3}{2}$$

$$x + 4 = \frac{3 \times 6}{2} = 9$$

$$\therefore \quad x = 5$$

$$\frac{y}{x} = \frac{4}{y}$$

$$y^2 = 4x = 4 \times 5$$

$$\therefore \quad y = 2\sqrt{5}$$

$$\frac{a}{y} = \frac{6}{4} = \frac{3}{2}$$

$$\therefore \quad a = \frac{3y}{2} = 3\sqrt{5}$$