1) Simplify $-5\left(\sqrt{18a^{25}b^{10}c^{16}}\right)$ $\boxed{\text{Andrew}\cdot D}$ (1)

soln.

$$\sqrt{18a^{25}b^{10}c^{16}} = \left(18a^{25}\cdot b^{10}c^{16}\right)^{1/2} = \sqrt{18}\cdot\sqrt{a}\cdot a^{\frac{24}{2}}\cdot b^{\frac{10}{2}}\cdot c^{\frac{16}{2}}$$

$$\sqrt{18} = \sqrt{9\times 2} = 3\sqrt{2}.$$

$$\therefore \sqrt{18a^{25}b^{10}c^{16}} = 3\sqrt{2}\, a^{12} b^{5} c^{8}\sqrt{a}$$

and

$$-5\sqrt{18a^{25}b^{10}c^{16}} = -5\times 3\sqrt{2}\cdot a^{12} b^{5} c^{6}\sqrt{a}$$

$$= -15\sqrt{2}\cdot a^{12}\cdot b^{5}\cdot c^{8}\cdot\sqrt{a}$$

2) Simplify $\left(5\sqrt{3p^3q^2}\right)\left(4\sqrt{6p^5q^3}\right)$

soln.

$$\sqrt{3p^3q^2} = \left(3p\cdot p^2\cdot q^2\right)^{1/2} = \sqrt{3}\cdot pq\cdot\sqrt{p}\cdot$$

$$\sqrt{6p^5q^3} = \left(6\cdot p\cdot p^4\cdot q\cdot q^2\right)^{1/2} = \sqrt{6}\cdot p^2\sqrt{p}\cdot q\sqrt{q}$$

$$\Leftrightarrow 5\times 4\left(\sqrt{3}\sqrt{6}\, p^2 pqq\sqrt{p}\sqrt{pq}\right)$$

but $\sqrt{6} = \sqrt{3\times 2} = \sqrt{3}\times\sqrt{2}.$

~~and~~

$$= \left(\sqrt{3}\cdot\sqrt{3}\cdot\sqrt{2}\, p^2 pqq\sqrt{p}\sqrt{pq}\right) 5\times 4$$

But $\sqrt{3} \cdot \sqrt{3} = 3$. and $p^2 \cdot p = p^3$ $\boxed{\text{Andrew. D}}$

$= 5\sqrt{p\cancel{q}} \cdot 4 \cdot 3\sqrt{2}\, p^3 \sqrt{pq}\; q\, q$

but $q \cdot q = q^2$ and $\sqrt{pq} = \sqrt{p} \cdot \sqrt{q}$

hence $\sqrt{p} \cdot \sqrt{p} = p$.

Therefore

$\Leftrightarrow 5 \cdot 4 \cdot 3\sqrt{2}\; p^3 \cdot p \cdot \cancel{p} q^2 \sqrt{q}$

$5 \times 4 \times 3 = 60$ and $p^3 \cdot p = p^4$

$= 60\sqrt{2} \cdot p^4 \cdot \sqrt{q} \cdot q^2$.

3) (a) $(\sqrt{12} - 3\sqrt{6})(5\sqrt{12} + \sqrt{6})$

soln.

$\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$.

$5\sqrt{12} = 5 \times 2\sqrt{3} = 10\sqrt{3}$

$= (2\sqrt{3} - 3\sqrt{6})(10\sqrt{3} + \sqrt{6})$

$= 2\sqrt{3}(10\sqrt{3} + \sqrt{6}) - 3\sqrt{6}(10\sqrt{3} + \sqrt{6})$

$= 20\sqrt{9} + 2\sqrt{18} - 30\sqrt{18} - 3\sqrt{36}$.

$= 20 \times 3 + (2 \times \sqrt{9 \times 2}) - (30\sqrt{9 \times 2}) - 3 \times 6$

$= 60 - 18 + (2 \times 3\sqrt{2}) - (30 \times 3\sqrt{2})$

$= 42 + 6\sqrt{2} - 90\sqrt{2}$

$= 42 - 84\sqrt{2}$.

b) $(\sqrt{21}+2)^2$. Andrew. D

soln.

We know that $(a+b)^2 = a^2 + 2ab + c^2$

$\therefore (\sqrt{21}+2)^2 = (\sqrt{21})^2 + 2 \cdot \sqrt{21} \cdot 2 + 2^2$

$* \quad = 21 + 4\sqrt{21} + 4$

$= 25 + 4\sqrt{21}$.

c) $(\sqrt{7}-5)(\sqrt{7}+5)$

soln.

We know that $(a+b)(a-b) = a^2 - b^2$.

$\therefore (\sqrt{7}+5)(\sqrt{7}-5) = (\sqrt{7})^2 - (5)^2$.

$= 7 - 25$

$= -18$

4.(a) $\dfrac{27}{5\sqrt{45}}$

soln.

$\cancel{\sqrt{45} = \sqrt{9\times5} = 3\sqrt{5}}$.

$\sqrt{45} = \sqrt{9\times5} = 3\sqrt{5}$ and $27 = 3^3$

$= \dfrac{3^3}{5\cdot 3\sqrt{5}} = \dfrac{3^2}{5\sqrt{5}} = \dfrac{9}{5\sqrt{5}}$.

Rationalize.

$\dfrac{9}{5\sqrt{5}} \cdot \dfrac{(-5\sqrt{5})}{(-5\sqrt{5})} = \dfrac{-9\times5\sqrt{5}}{-25\times5} = \dfrac{9\sqrt{5}}{25}$.

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b) $\dfrac{(\sqrt{x}-8)}{(\sqrt{x}+2)}$

Soln.

Multiply by the conjugate.

$$\frac{(\sqrt{x}-8)}{(\sqrt{x}+2)}\frac{(\sqrt{x}-2)}{(\sqrt{x}-2)} = \frac{(\sqrt{x}-8)(\sqrt{x}-2)}{(\sqrt{x})^2-(2)^2}.$$

but $(\sqrt{x}-8)(\sqrt{x}-2) = \sqrt{x}(\sqrt{x}-2)-8(\sqrt{x}-2)$

$$= x-2\sqrt{x}-8\sqrt{x}+16.$$

$$= x-10\sqrt{x}+16.$$

$$= \frac{16+x-10\sqrt{x}}{x-4}$$

5) solve for $\sqrt{2z+19}-z=2$.

soln.

$\Leftrightarrow \sqrt{2z+19} = 2+z$. square both sides

$\Leftrightarrow 2z+19 = (2+z)^2$

$\Rightarrow 2z+19 = 4+4z+z^2$

$\Leftrightarrow z^2+2z-15=0$.

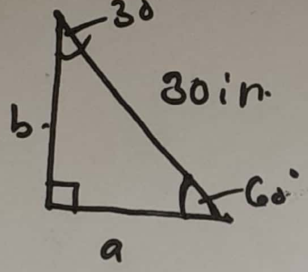
$P=-15$ No:-3, 5.

$S=2$.

$z=3, -5$.

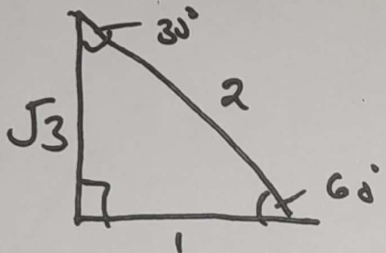
verify solutions : when $z=3 \Rightarrow$ True when $z=-5$, false.

$\therefore z=3$

6) 

Soln.

Using special triangles



Since the triangles are similar.

$$\frac{2}{30} = \frac{\sqrt{3}}{b}$$

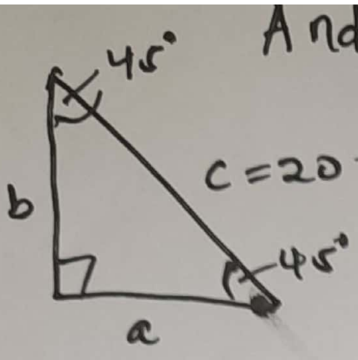
$$b = \sqrt{3} \cdot \frac{\cancel{30}^{15}}{\cancel{2}} = \frac{\sqrt{3} \times 15}{1} = 15\sqrt{3}.$$

$$\frac{2}{30} = \frac{1}{a} \quad , a = \frac{30}{2} = 15$$

$$a = 15$$

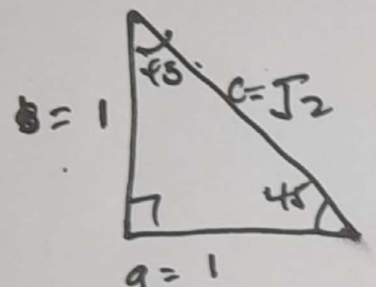
$$b = 15\sqrt{3}$$

Andrew. D

7) 

soln

Using special triangles.



Similarity : since the two triangles are similar

$$\frac{\sqrt{2}}{20} = \frac{1}{a} \iff a = \frac{20}{\sqrt{2}} = \frac{\sqrt{\cancel{2} \times \cancel{10}}}{\sqrt{\cancel{2}}}$$

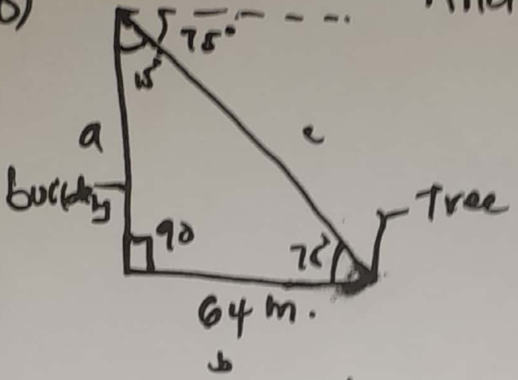
$$= \frac{\sqrt{\cancel{2}} \cdot \sqrt{10}}{\sqrt{\cancel{2}}} = \sqrt{1\cancel{0}}$$

but a = b

~~hence = $\sqrt{10}$ and b = $\sqrt{10}$.~~

$a = \frac{20}{\sqrt{2}}$ and $b = \frac{20}{\sqrt{2}}$

8)



soln.

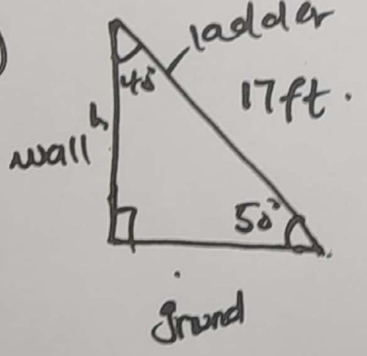
Using sin rule. $\frac{a}{\sin a} = \frac{b}{\sin b}$.

$$\frac{a}{\sin 75} = \frac{64}{\sin 15}.$$

$$\therefore\ a = \frac{64}{\sin 15} \times \sin 75$$

$$= 238.85\ \text{m}.$$

9)



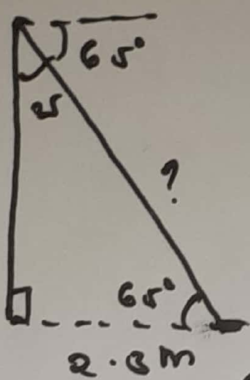
Using sin rule

$$\frac{h}{\sin 50} = \frac{17}{\sin 90} \qquad \text{but } \sin 90 = 1$$

$$h = \frac{17}{1} \times \sin 50.$$

$$= 13.02.$$

10) Andrew. D



soln

$90 - 65 = 25$.

Using sin role,

$$\frac{2.3}{\sin 25} = \frac{h}{\sin 90}$$ but $\sin 90 = 1$

$$\therefore h = \frac{2.3}{\sin 25} = \frac{2.3}{0.4226}$$

$$= 5.44 \text{ m}.$$