

Shrewsbury 2022

1) a) $-6a + 22b$

b) $3x^2 - x - 10$

2) a) $2cd(2d + 3c)$

b) $(t - 5)(t - 3)$

3) a) i) $6 + \frac{8}{12} + \frac{3}{12} = 6\frac{11}{12}$

ii) $\frac{14}{3} \times \frac{9}{4} = \frac{7 \times 3}{2} = \frac{21}{2} = 10\frac{1}{2}$

b) $64t^{20}$

4) a) $\frac{33}{12} \times 10 = \frac{11}{4} \times 10 = \frac{11 \times 5}{2} = 27\frac{1}{2}\%$

b) $x \times 0.55 = 649$
 $x = \frac{649}{0.55} = \frac{649}{55} = \frac{59}{5} = \pounds 11.80$

c) $\frac{67000}{29000} = 2.31$ so 131% increase

5) a) $V = \frac{10 \times 7.5 \times 6}{2} = 225 \text{ cm}^3$

b) $A = 7.5 \times 6 + 10 \times 6 + 2 \times \frac{7.5 \times 10}{2} + 12.5 \times 6$
 $= 255 \text{ cm}^2$

c) $\tan \theta = \frac{7.5}{10}$ $\theta = 36.9^\circ$

6) a) $D = kv^2$ $20 = k \times 4^2$ $k = \frac{5}{4}$ $D = \frac{5}{4}v^2$

b) $50 = \frac{5}{4}v^2$ $v =$

by Pythag.

7) a) $x = \frac{5-3y}{4}$

b) $x = \frac{z}{p} - 5$

c) $x = 4 \pm \sqrt{\frac{9}{3}}$

d) $xM - 4M = x + 2$
 $x = \frac{4M + 2}{M - 1}$

8) a) $x = 3$

b) $6x + 15 = 8x$
 $x = \frac{15}{2}$

c) $(3x - 1)(x - 5) = 0$
 $x = \frac{1}{3}$ or 5

d) $(x^2 - 3)^{2009} ((x^2 - 3)^2 - 4) = 0$
 $x^2 = 3$ or $x^2 - 3 - 2 = 0$ or $x^2 - 3 + 2 = 0$
 $x = \pm\sqrt{3}$ or $x = \pm\sqrt{5}$ or $x = \pm 1$

B1) a) $x^2 - 4x + 4$

b) $(0, 1), (1, 0)$

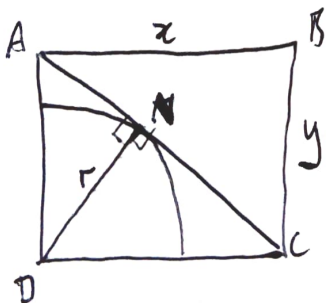
c) $x^2 - 4x + y^2 + 8y + 16 = 0$
 $(x-2)^2 - 4 + (y+4)^2 - 16 + 16 = 0$
 $(x-2)^2 + (y+4)^2 = 4$

Possibilities:

$(x-2)^2$	$(y+4)^2$	$x-2$	$y+4$	x	y
0	4	0	± 2	2	-2 or -6
4	0	± 2	0	0 or 4	-4

$(2, -2)$	$(2, -6)$
$(0, -4)$	$(4, -4)$

B2)



ABC is similar to AND:

$$AC = \sqrt{x^2 + y^2}$$

$$\frac{ND}{AD} = \frac{AB}{AC}$$

$$\frac{r}{y} = \frac{x}{\sqrt{x^2 + y^2}}$$

$$r^2 = \frac{x^2 y^2}{x^2 + y^2}$$

area of quarter circle = $\frac{1}{4} \pi r^2$
 $= \frac{1}{4} \pi \frac{x^2 y^2}{x^2 + y^2}$

Proportion = $\frac{\pi}{4} \frac{xy}{x^2 + y^2}$

133) a) Sandwiches: $\frac{3 \text{ options}}{R}$ $\frac{2 \text{ options}}{G}$ $\frac{1 \text{ option}}{B}$ $3! = 6 \text{ options}$

Same for choc / drink $\rightarrow 6^3 = 216$.

b) Order all 9 items into positions $R_1, R_2, R_3, G_1, \dots, B_3$
That is $9!$ ways.

Now within each box divide by $3!$ for duplication

$$\frac{9!}{3!3!3!} = \frac{\overset{3}{9} \times 8 \times 7 \times 6 \times \overset{2}{5} \times 4 \times 3 \times 2 \times 1}{3 \times 2 \times 1 \times 3 \times 2 \times 1}$$

$$= 8 \times 7 \times 5 \times 2$$

$$= 560$$

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