Relationships Practice Questions

(1) a) $y-4=5(x-1)$

$y-4=5x-5$

$y=5x-1$

b) $y-6=3(x+1)$

$y-6=3x+3$

$y=3x+9$

c) $y+3=-2(x-5)$

$y+3=-2x+10$

$y=-2x+7$

d) $y+5=-3(x+2)$

$y+5=-3x-6$

$y=-3x-11$

(2) a) $4a-12<2a-3$

$2a-12<-3$

$2a<9$

$a<4\frac{1}{2}$

b) $7e+5<3e+6$

$4e+5<6$

$4e<1$

$e<\frac{1}{4}$

c) $5x-3>2x+7$

$3x-3>7$

$3x>10$

$x>\frac{10}{3}$

d) $4y-5>2y-6$

$2y-5>-6$

$2y>-1$

$y>-\frac{1}{2}$

(3) a) $2a+3c=24.40$

b) $2a+4c=20.60$

c) $4a+7c=145.50$

d) $5a+8c=64.50$

(4) a) $4x+2y=26$ $\xrightarrow{\times 1}$ $4x+2y=26$

$x-y=2$ $\xrightarrow{\times 2}$ $2x-2y=4$

$6x=30$

$x=5$

$5-y=2$

$y=3$

$x=5$, $y=3$

b) $4a-y=16$ $\xrightarrow{\times 3}$ $12a-3y=48$

$5a+3y=3$ $\xrightarrow{\times 1}$ $5a+3y=3$

$17a=51$

$a=3$

$4(3)-y=16$

$12-y=16$

$y=-4$

$a=3$, $y=-4$

c) $2p-5w=1$ $\xrightarrow{\times 1}$ $2p-5w=1$

$5p+w=16$ $\xrightarrow{\times 5}$ $25p+5w=80$

$27p=81$

$p=3$

$2(3)-5w=1$

$6-5w=1$

$-5w=-5$

$w=1$

$p=3$, $w=1$

d) $2m+d=3$ $\xrightarrow{\times 3}$ $6m+3d=9$

$4m-3d=31$ $4m-3d=31$

$10m=40$

$m=4$

$2(4)+d=3$

$8+d=3$

$d=-5$

$m=4$, $d=-5$

(5) a) $G = \frac{5d}{6} + 16$

$G - 16 = \frac{5d}{6}$

$6(G-16) = 5d$

$\frac{6(G-16)}{5} = d$

$d = \frac{6(G-16)}{5}$

b) $V = \frac{6x}{7} + 21$

$V - 21 = \frac{6x}{7}$

$7(V-21) = 6x$

$\frac{7(V-21)}{6} = x$

$x = \frac{7(V-21)}{6}$

c) $H = \frac{8f}{11} + 30$

$H - 30 = \frac{8f}{11}$

$11(H-30) = 8f$

$\frac{11(H-30)}{8} = f$

$f = \frac{11(H-30)}{8}$

d) $G = \frac{3w}{5} + 16$

$G - 16 = \frac{3w}{5}$

$5(G-16) = 3w$

$\frac{5(G-16)}{3} = w$

$w = \frac{5(G-16)}{3}$

(6) a) $y = kx^2$

sub (1, 3)

$3 = k(1)^2$

$3 = k$

$k = 3$

b) $y = kx^2$

sub (1, 4)

$4 = k(1)^2$

$k = 4$

c) $y = kx^2$

sub (2, 2)

$2 = k(2)^2$

$2 = 4k$

$\frac{1}{2} = k$

$k = \frac{1}{2}$

d) $y = kx^2$

sub (1, 5)

$5 = k(1)^2$

$k = 5$

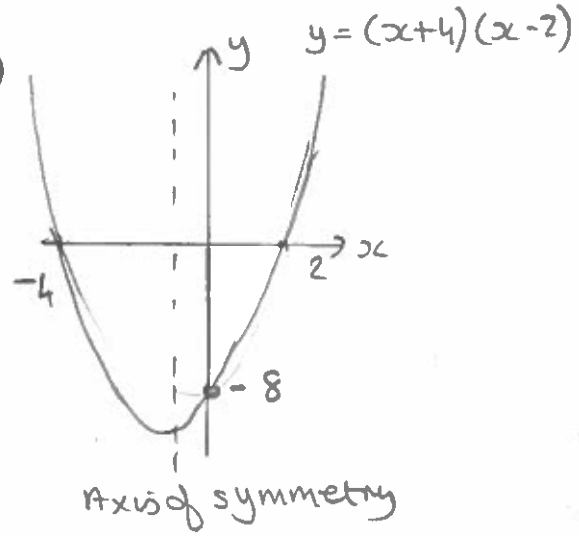
(7) a) $y = (x+3)^2 + 3$

$\therefore \quad a = 3, \; b = 3$

b) $y = (x-2)^2 + 1$

$a = -2 \quad b = 1$

(8) a)



Axis of symmetry

$x = -1$

when $x = -1$, $y = (-1+4)(-1-2)$

$= (3)(-3)$

$= -9$

$(-1, -9)$

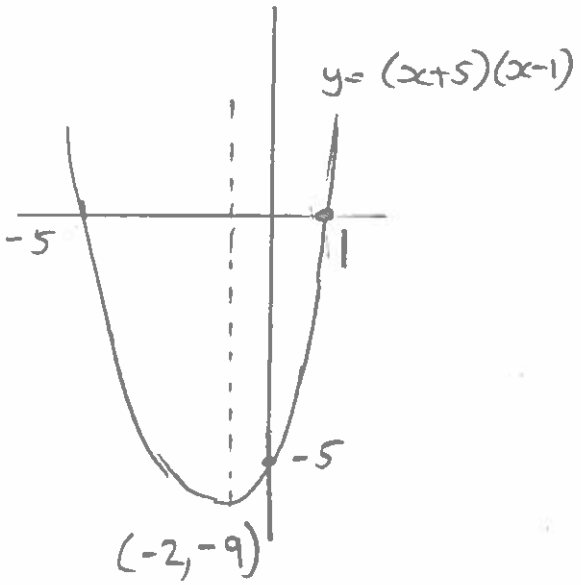
cuts y-axis when $x = 0$,

$y = (0+4)(0-2)$

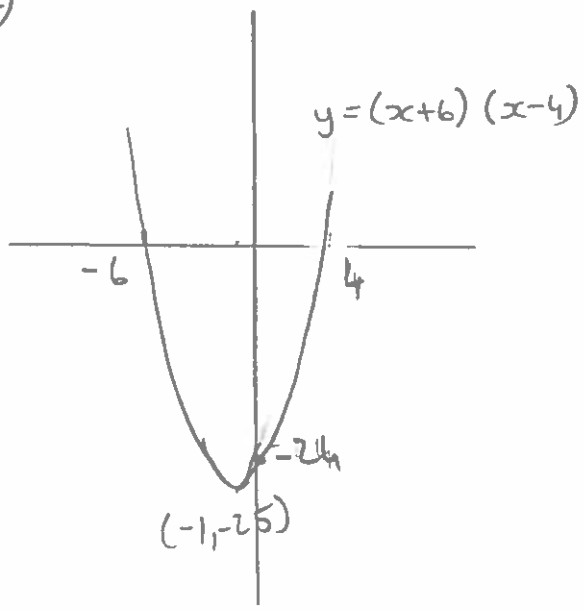
$= (4)(-2)$

$= -8$

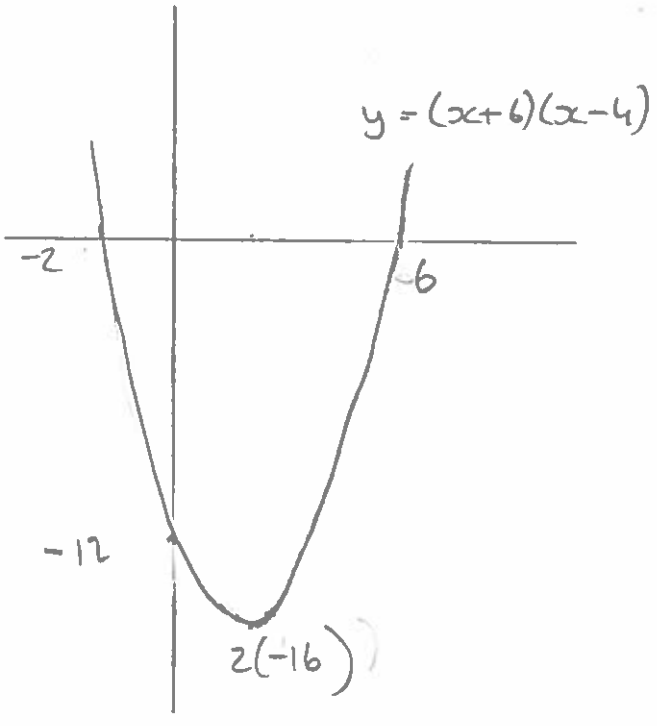
b)



c)



d)



(9) a) $y = (x-6)^2 - 4$

(i) $x = 6$

(ii) $(6, -4)$ Minimum TP

b) $y = (x-3)^2 - 2$

(i) $x = 3$

(ii) $(3, -2)$ Min TP

c) $y = (x-1)^2 - 5$

(i) $x = 1$

(ii) $(1, -5)$ Min. TP

d) $y = (x-2)^2 - 1$

(i) $x = 2$

(ii) $(2, -1)$ Minimum

(10) a) $(x-4)(x+5) = 0$

either $x - 4 = 0$ or $x + 5 = 0$

$x = 4$ $x = -5$

b) $(x-2)(x+7) = 0$

$x = 2$ or $x = -7$

c) $(x+6)(x-8) = 0$

$x = -6$ or $x = 8$

d) $(x+1)(x-9) = 0$

$x = -1$ or $x = 9$

(11) a) $x^2 + 2x - 1 = 0$

$a = 1$ $b = 2$ $c = -1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-2 \pm \sqrt{(2)^2 - (4 \times 1 \times -1)}}{2 \times 1}$$

$$= \frac{-2 \pm \sqrt{4 - (-4)}}{2}$$

$$= \frac{-2 \pm \sqrt{8}}{2}$$

either $x = \frac{-2 + \sqrt{8}}{2}$ or $x = \frac{-2 - \sqrt{8}}{2}$

$= 0.4142\ldots$ $= -2.4142$

$= 0.41$ (2dp) $= -2.41$ (2dp)

$x = 0.41, -2.41$

(11) b) $x^2 + 3x - 6 = 0$

$a = 1 \quad b = 3 \quad c = -6$

$$x = \frac{-3 \pm \sqrt{(3)^2 - (4 \times 1 \times -6)}}{2 \times 1}$$

$$= \frac{-3 \pm \sqrt{9 + 24}}{2}$$

$$= \frac{-3 \pm \sqrt{33}}{2}$$

$x = 1.37, -4.37$ (2dp)

$$x = \frac{-3 + \sqrt{33}}{2} \quad \text{or} \quad x = \frac{-3 - \sqrt{33}}{2}$$

$= 1.372\ldots$ $\quad -4.372$

c) $x^2 + 4x - 3 = 0$

$a = 1 \quad b = 4 \quad c = -3$

$$x = \frac{-4 \pm \sqrt{16 - (-12)}}{2}$$

$$= \frac{-4 \pm \sqrt{28}}{2}$$

$x = 0.65, -4.65$ (2dp)

$x = 0.645\ldots$ or $x = -4.645$

d) $x^2 + 3x - 7 = 0$

$a = 1 \quad b = 3 \quad c = -7$

$$x = \frac{-3 \pm \sqrt{9 - (-28)}}{2}$$

$$= \frac{-3 \pm \sqrt{37}}{2}$$

$x = 1.54, -4.54$ (2dp)

$x = 1.541\ldots$ or $x = -4.541\ldots$

(12) a) $3x^2 - 7x + 2 = 0$

$a = 3 \quad b = -7 \quad c = 2$

$b^2 - 4ac$

$(-7)^2 - (4 \times 3 \times 2)$

$49 - 24$

$= 25$

Disc > 0 $\therefore$ 2 real, distinct roots

b) $2x^2 - 3x + 4 = 0$

$a = 2 \quad b = -3 \quad c = 4$

$b^2 - 4ac$

$(-3)^2 - (4 \times 2 \times 4)$

$9 - 32$

$= -23$

Disc < 0 $\therefore$ no real roots

c) $x^2 - 6x + 9 = 0$

$a = 1 \quad b = -6 \quad c = 9$

$b^2 - 4ac$

$(-6)^2 - (4 \times 1 \times 9)$

$36 - 36$

$= 0$

Disc $= 0$ $\therefore$ 2 equal, real roots

d) $3x^2 - 6x + 3 = 0$

$a = 3 \quad b = -6 \quad c = 3$

$b^2 - 4ac$

$(-6)^2 - (4 \times 3 \times 3)$

$36 - 36$

$= 0$

Disc $= 0$ $\therefore$ 2 equal, real roots

(13) If $6.3^2 + 2.8^2 = 7.2^2$, then the Δ is right-angled

LHS $6.3^2 + 2.8^2$ RHS 7.2^2

$39.69 + 7.84$ 51.84

$= 47.53$

$47.53 \neq 51.84$ $\therefore$ triangle is not right-angled

b) If $9.3^2 + 8.1^2 = 12.5^2$, then the Δ is right-angled

LHS $9.3^2 + 8.1^2$ RHS 12.5^2

$= 152.1$ 156.25

LHS $\neq$ RHS $\therefore$ the triangle is not right-angled

c) If $10.5^2 + 14^2 = 17.5^2$ the triangle is right-angled

LHS $10.5^2 + 14^2$ RHS 17.5^2

$= 306.25$ 306.25

LHS = RHS $\therefore$ the triangle is right-angled

d) If $33.6^2 + 14^2 = 36.4^2$ the Δ is right-angled

LHS $33.6^2 + 14^2$ RHS 36.4^2

$= 1324.96$ $= 1324.96$

LHS = RHS $\therefore$ the Δ is right-angled

(14) a) $S\hat{V}U = 360^\circ - 90^\circ - 90^\circ - 156^\circ$

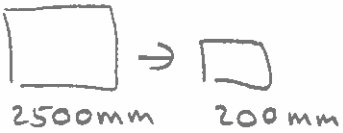
$= 24^\circ$

b) $S\hat{V}U = 360^\circ - 90^\circ - 90^\circ - 161^\circ$

$= 19^\circ$

c) $S\hat{V}U = 360^\circ - 90^\circ - 90^\circ - 143^\circ$

$= 37^\circ$

(15) a) 

Scale factor $= \frac{200}{2500}$

$= \frac{2}{25}$

Volume factor $= \left(\frac{2}{25}\right)^3$

New vol $= \left(\frac{2}{25}\right)^3 \times 36000\ cm^3$

$= 18.432\ cm^3$

b) 

Scale factor $\frac{70}{150}$

$= \frac{7}{15}$

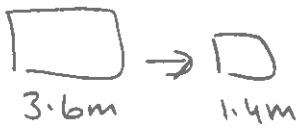
Volume factor $= \left(\frac{7}{15}\right)^3$

New vol $= \left(\frac{7}{15}\right)^3 \times 2550\ l$

$= 259.155\ldots$

$= 259.2$ litres

(15) c)



scale factor = $\frac{1.4}{3.6}$

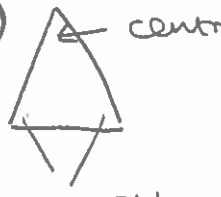
volume factor = $\left(\frac{1.4}{3.6}\right)^3$

New vol = $\left(\frac{1.4}{3.6}\right)^3 \times 43200$ litres

= 2540.740... l

= 2540.7 l

(16) a) centre angle $\frac{360 \div 7}{}$ 51.4° (1dp)



$\frac{180 - 51.4}{2}$

= 64.3°

Shaded angle = 64.3 × 2

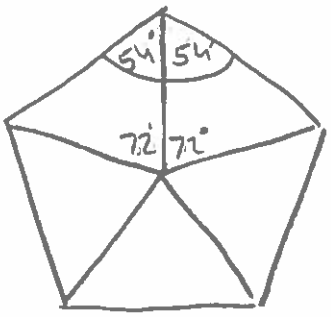
= 128.6°

b) centre angle 360° ÷ 5

= 72°

$\frac{180 - 72°}{2}$

= 54°



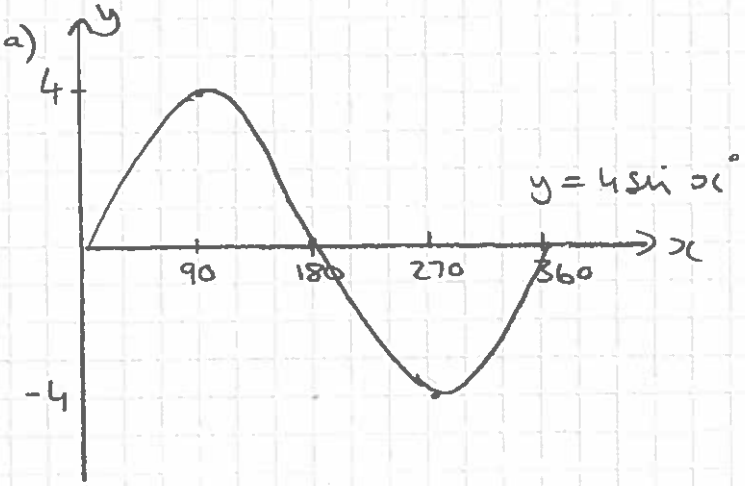
Shaded angle

= 54° × 2

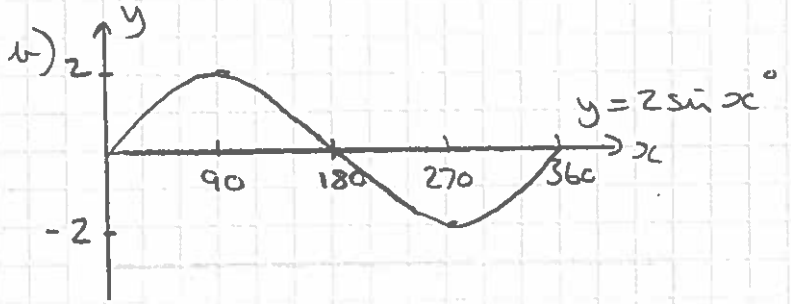
= 108°

(17)

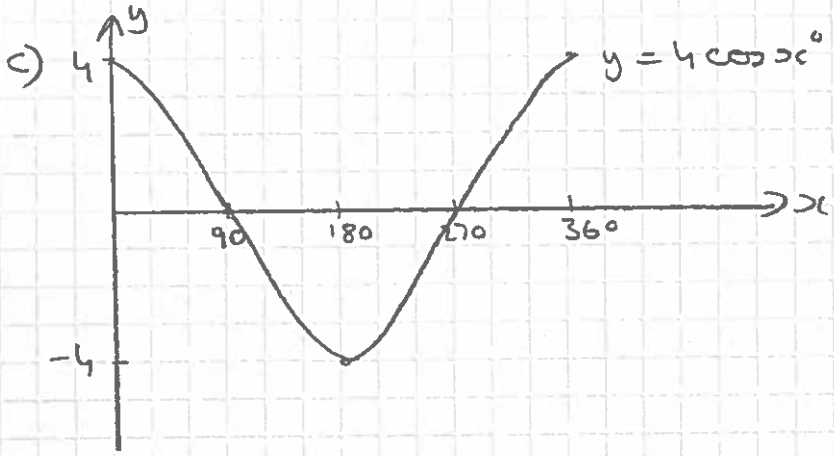
a)


y
4
-4
90
180
270
360
x
y = 4 sin x°

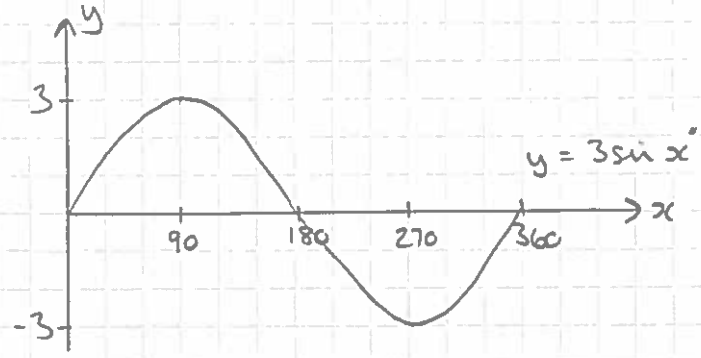
b)


y
2
-2
90
180
270
360
x
y = 2 sin x°

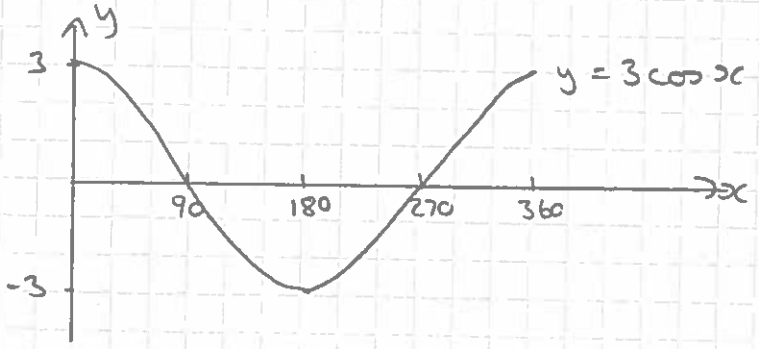
c)


y
4
-4
90
180
270
360
x
y = 4 cos x°

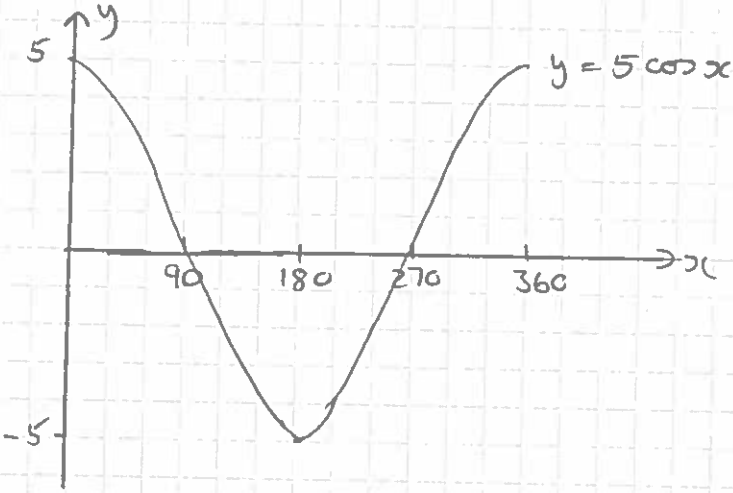
d)


y
3
-3
90
180
270
360
x
y = 3 sin x°

e)



f)



(18) a) $360° \div 3 = 120°$

b) $360° \div 4 = 90°$

c) $360° \div 2 = 180°$

d) $360° \div 5 = 72°$

e) $360° \div 9 = 40°$

f) $360° \div 12 = 30°$

(19) a) $4 \sin x° - 1 = 0$

$\sin x° = \frac{1}{4}$

$x = 14.5°$ and $165.5°$

b) $5 \cos x° - 2 = 0$

$\cos x° = \frac{2}{5}$

$x = 66.4°$ and $293.6°$

c) $3 \sin x° - 2 = 0$

$\sin x° = \frac{2}{3}$

$x = 41.8°$ and $138.2°$

d) $3 \cos x° - 2 = 0$

$\cos x° = \frac{2}{3}$

$x = 48.2°$ and $311.8°$

e) $2 \cos x° - 1 = 0$

$\cos x° = \frac{1}{2}$

$x = 60°$ and $300°$

f) $5 \sin x° - 2 = 0$

$\sin x° = \frac{2}{5}$

$x = 23.6°$ and $156.4°$