NEW CENTURY MATHS 11
MATHEMATICS STANDARD (PATHWAY 2)

FULLY WORKED SOLUTIONS

Chapter 2: Formulas and equations

SkillCheck

Question 1

a -27

b $9-3=6$

c -8

d $-5\times(-5)=25$

e -4

f $-2+4=2$

Question 2

a $8\times3-9=24-9$

$=15$

b $\dfrac{3+6}{3}=\dfrac{9}{3}$

$=3$

c $7+3\times3=7+9$

$=16$

d $\sqrt{12\times3}=\sqrt{36}$

$=6$

e $3^5=243$

f $2\times3^2=2\times9$

$=18$

Question 3

a $(-2)^2-4=4-4$

$=0$

b $3(-2+1)=3\times-1$

$=-3$

c $8-(-2)=8+2$

$=10$

d $(-2)^7=-128$

e $\dfrac{-18}{-2}=9$

f $5-2\times-2=5+4$

$=9$

Question 4

a $x-3$

b $20-a$

c -3

Question 5

a $3\times 2x-3\times 1=6x-3$

b $7\times 4a+7\times 5=28a+35$

c $-2\times 6p-(-2)\times 2=-12p+4$

Question 6

a $3b=-15$

$b=\dfrac{-15}{3}$

$b=-5$

b $w-8=9$

$w=9+8$

$w=17$

c $2r+4=22$

$2r=22-4$

$2r=18$

$r=\dfrac{18}{2}$

$r=9$

Question 7

$A=\dfrac{1}{2}(10+15)\times 3$

$=\dfrac{1}{2}\times 25\times 3$

$=37.5$

Question 1

a $2x^2 + x^2 + 3x + 2x = 3x^2 + 5x$

b $2ab + 5ab + a + b = 7ab + a + b$

c $-4m^2 + 6m^2 + 10 - 5 = 2m^2 + 5$

d $3r - 7r + 4ar - 2ar = -4r + 2ar$

e $y^2 + 2y - 5$

f $2a^2 - a^2 - 4 + 6 = a^2 + 2$

g $k^2 - 4k - 1$

h $-3de + 2d$

i $p^2 - p^2 - p - 5p = -6p$

j $7u - 3u - 5 - 10 = 4u - 15$

k $t^2 + t^2 + at + 2at = 2t^2 + 3at$

l $15x + 3x - 5 + 5 = 18x$

Question 2

a $4 \times 4 \times a \times a \times k \times m = 16a^2km$

b $-3 \times 8 \times c \times d \times d = -24cd^2$

c $\frac{1}{4} \times 10 \times t \times t^2 \times w \times w = \frac{10}{4}t^3w^2$

$= \frac{5}{2}t^3w^2$

d $5 \times 5 \times x^3 \times x^3 = 25x^6$

e $9 \times \frac{2}{3} \times n^2 \times n^2 = \frac{18}{3} \times n^4$

$= 6n^4$

f $7 \times 2 \times k^3 \times k^2 \times p \times p = 14k^5p^2$

g $-6 \times (-6) \times m \times n = 36mn$

h $5 \times \frac{3}{10} \times e \times e^2 = \frac{15}{10}e^3$

$= \frac{3}{2}e^3$

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

j $10 \times (-2) \times a \times a \times b \times b = -20a^2b^2$

k $-4 \times \frac{1}{4} \times n^3 \times n^3 = -n^6$

l $-3 \times (-3) \times k \times k = 9k^2$

Question 3

a $\frac{4}{2} \times \frac{m}{m} = 2$

b $\frac{14}{2} \times \frac{x^2 y}{xy} = 7x$

c $\frac{-15}{3} \times \frac{e^2}{e^2} = -5$

d $\frac{10}{5} \times \frac{u^2 t^3}{ut^2} = 2ut$

e $3 \times \frac{x}{x^3} = 3 \times \frac{1}{x^2}$

$= \frac{3}{x^2}$

f $\frac{27}{-9} \times \frac{pr}{pq} = \frac{-3r}{q}$

g $\frac{12}{20} \times \frac{g^2 h}{gh} = \frac{3}{5} g \quad (\text{OR} = \frac{3g}{5})$

h $\frac{a^2}{a^3} = \frac{1}{a}$

i $\frac{15}{9} \times \frac{m^4 n}{m^2 n^2} = \frac{5}{3} \times \frac{m^2}{n}$

$= \frac{5m^2}{3n}$

j $\frac{-4}{20} \times \frac{de}{e} = \frac{-1}{5} \times d$

$= -\frac{d}{5}$

k $\frac{u}{4u} = \frac{1}{4}$

l $\frac{6}{24} \times \frac{wx^2}{w^2} = \frac{1}{4} \times \frac{x^2}{w}$

$= \frac{x^2}{4w}$

Question 4

$\frac{2}{5} \times \frac{-3}{10} \times \frac{xy}{y} = \frac{-6}{50} \times x$

$= -\frac{3x}{25}$

$\therefore$ A

Question 5

a $\frac{45y^2}{4}$

b $\frac{8ah}{35}$

c $\frac{\cancel{x}^{1}}{\cancel{3}^{1}} \times \frac{\cancel{6}^{2}}{\cancel{x}^{1}} = 2$

d $\frac{20r}{6} \times \frac{1}{4r} = \frac{5}{6}$

e $\frac{4nw}{b} \times \frac{bn}{2w} = 2n^2$

f $\frac{3m}{6m} \times \frac{10n^2}{4n} = \frac{1}{2} \times \frac{5n}{2}$

$= \frac{5n}{4}$

g $\frac{4a}{5} \times \frac{7}{2h} = \frac{14a}{5h}$

h $\frac{2e}{5} \times \frac{8}{3e} = \frac{16}{15}$

$= 1\frac{1}{15}$

i $\frac{2de}{7p} \times \frac{14p}{4e} = d$

Question 6

a $-k^2 + 2k - 4k + 8 = -k^2 - 2k + 8$

b $\frac{1}{2} \times ay^2 \times y^2 = \frac{1}{2}ay^4$

c $\frac{-5t}{-20t} = \frac{1}{4}$

d $\frac{-32f^3g^2}{4f^2g} = -8fg$

e $-3c^2 - 7c^2 + 7c + 6c = -10c^2 + 13c$

f $-4z^2 + 4z + z + 8 = -4z^2 + 5z + 8$

g $-3 \times -2 \times a \times a^2 = 6a^3$

h $\frac{24cd}{8de} = \frac{3c}{e}$

i $2 - 4m^2 - 6m^2 - 2 = -10m^2$

j $\frac{20n^3x}{10nx^2} = \frac{2n^2}{x}$

k $4x^2 - 2xy + 4xy + 3x = 4x^2 + 2xy + 3x$

l $\frac{6a^4m^2}{-2a^2m^2} = -3a^2$

Exercise 2.02 Expanding algebraic expressions

Question 1

a $3\times a+3\times 2=3a+6$

b $5\times 3-5\times 2b=15-10b$

c $-2\times 2a+(-2)\times 1=-4a-2$

d $-6\times b+-6\times(-2)=-6b+12$

e $3x\times x-3x\times 2=3x^2-6x$

f $3p\times p-3p\times a=3p^2-3ap$

g $-4\times 2k+(-4)\times 4=-8k-16$

h $2t\times 3-2t\times 4t=6t-8t^2$

i $-d\times d-(-d)\times 5=-d^2+5d$

j $k\times 7-k\times 5k=7k-5k^2$

k $-9b\times b-(-9)b\times 1=-9b^2+9b$

l $2y\times 7x+2y\times 4y=14xy+8y^2$

Question 2

a $-6n\times 4-(-6n)\times n=-24n+6n^2$

b $5x\times rx+5x\times 2r=5rx^2+10rx$

c $-1\times 2a^2-(-1)\times 4=-2a^2+4$

d $5b\times a^2+5b\times 3b+5b\times(-7)=5a^2b+15b^2-35b$

e $-1\times x^2-(-1)\times 4x+(-1)\times 10=-x^2+4x-10$

f $3h\times h-3h\times 7e-3h\times 4eh=3h^2-21eh-12eh^2$

g $y\times 2y+y\times 3-y\times y^2=2y^2+3y-y^3$

h $de\times d^2-de\times 2+de\times e^2=d^3e-2de+de^3$

i $-3v\times(-3av)+(-3v)\times v-(-3v)\times 2a=9av^2-3v^2+6av$

Question 3

a $5x + 20 - 2x - 6 = 3x + 14$

b $3d - 12 - 2d - 10 = d - 22$

c $6r + 60 - 4r + 20 = 2r + 80$

d $8f + 16 - f - 7 = 7f + 9$

e $6x - 12 - 15x - 20 = -9x - 32$

f $6x^2 + 24x - 3x^2 + 3x = 3x^2 + 27x$

g $3b^2 + 15b - b^2 + 8b = 2b^2 + 23b$

h $4w^2 - 28w - w^2 - w = 3w^2 - 29w$

i $6k + 6p + 3k + 6p = 9k + 12p$

j $2a - 2b + 2b + 2a = 4a$

k $2vx + 4x - vx - x = vx + 3x$

l $-3t - 3w - 4t + 2w = -7t - w$

m $3e^2 + 5e - 2e + e^2 = 4e^2 + 3e$

n $-2a - 6 + 4a - 12 = 2a - 18$

o $p^2 - pq - q^2 + pq = p^2 - q^2$

Question 4

a 2 and –2; opposites

b –6 and 6

c yes; $-b(b - a) = -b + a$

$= a - b$

Exercise 2.03 Formulas

Question 1

a $10^2-(-3)^2=100-9$

$=91$

b $\dfrac{10+6}{-3\times 6}=\dfrac{16}{-18}$

$=-\dfrac{8}{9}$

c $\sqrt{6+3\times 10}=\sqrt{36}$

$=6$

d $4\left[3\times(-3)+9\right]=4(-9+9)$

$=4\times 0$

$=0$

e $8\times 6+4\times(-3)=48-12$

$=36$

f $\dfrac{2\times 10}{5}=\dfrac{20}{5}$

$=4$

g $10(10-4)=10\times 6$

$=60$

h $\sqrt{\dfrac{9\times 10}{6+4}}=\sqrt{\dfrac{90}{10}}$

$=\sqrt{9}$

$=3$

i $6^2+6=36+6$

$=42$

j $\dfrac{2\times(-3)\times 6}{3}=\dfrac{-36}{3}$

$=-12$

k $\sqrt{(-3)^2+7\times 6-2}=\sqrt{9+42-2}$

$=\sqrt{49}$

$=7$

l $(-3-10)^2=(-13)^2$

$=169$

Question 2

$V=\pi\times 4.07^2\times 11.58$

$=602.625...$

$\approx 602.63\,\text{cm}^3$

Question 3

a $T=18\times 4+28$

$=100°\text{C}$

b $T=18\times 1\frac{1}{2}+28$

$=55°\text{C}$

c $T=18\times 0+28$

$=28°\text{C}$

Question 4

a $US=0.722\times 20$

$=\$14.44$

b $US=0.722\times 89.50$

$=\$64.619$

$\approx\$64.62$

c $US=0.722\times 4800$

$=\$3465.60$

Question 5

a v

b $v = 6 + 2 \times 5$
$= 16 \text{ m/s}$

Question 6

a $m = 2 \times 8 + 1$
$= 17$

b $m = 2 \times 40 + 1$
$= 81$

c $m = 2 \times 150 + 1$
$= 301$

Question 7

$V = \frac{4}{3} \times \pi \times 14.5^3$
$= 12\,770.05...$
$\approx 12\,770.1 \text{ cm}^3$

Question 8

$T = 2\pi\sqrt{\frac{2.35}{10}}$
$= 2\pi \times \sqrt{0.235}$
$= 3.0458...$
$\approx 3.05 \text{ sec}$

Question 9

$A = 5600(1 + 0.094)^5$
$= \$8775.56$

Question 10

$d = \frac{11.5^2}{9.8}$
$= 13.494...$
$\approx 13.5 \text{ m}$

Question 11

a B

b $B = \frac{60}{1.7^2}$
$= 20.761...$
≈ 20.8

c Increase her weight to around 65 kg.

Question 12

a $C = \frac{5}{9}(77 - 32)$

$= 25°\text{C}$

b $C = \frac{5}{9}(100 - 32)$

$= 37\frac{7}{9}°\text{C}$

$\approx 38°\text{C}$

c $C = \frac{5}{9}(59 - 32)$

$= 15°\text{C}$

d $C = \frac{5}{9}(98.4 - 32)$

$= 36.88...°\text{C}$

$\approx 37°\text{C}$

Question 13

$M = \frac{5 \times 80}{18}$

$= 22.22...\text{ m/s}$

$\therefore$ A

Question 14

a $\text{Fried's rule} = \frac{\text{age in months}}{150} \times \text{ adult dosage}$

$= \frac{24 \text{ months}}{150} \times 900$

$= 144 \text{ mg}$

b $\text{Young's rule} = \frac{\text{age in years}}{\text{age in years} + 12} \times \text{ adult dosage}$

$= \frac{2}{2 + 12} \times 900$

$= 128.57...$

$\approx 129 \text{ mg}$

Question 15

$\text{Clark's rule} = \frac{\text{weight in kg}}{70} \times \text{ adult dosage}$

$= \frac{50 \text{ kg}}{70} \times 1680 \text{ mg}$

$= 1200 \text{ mg}$

$\therefore$ A

Question 16

$$\text{Cowling's rule} = \frac{\text{age in years} + 1}{24} \times \text{ adult dosage}$$

a $\frac{2+1}{24} \times 100 = 12.5 \text{ mg}$

b $\frac{6+1}{24} \times 100 = 29.16... \text{ mg} \approx 29.2 \text{ mg}$

c $\frac{10.5+1}{24} \times 100 = 47.916... \text{ mg} \approx 47.9 \text{ mg}$

Question 17

a $\text{Young's rule} = \frac{\text{age in years}}{\text{age in years} + 12} \times \text{ adult dosage}$

$$= \frac{1\frac{1}{2}}{1\frac{1}{2}+12} \times 1000$$
$$= 111.11...$$
$$\approx 111 \text{ mg}$$

b $\text{Fried's rule} = \frac{\text{age in months}}{150} \times \text{ adult dosage}$

$$= \frac{18 \text{ months}}{150} \times 1000$$
$$= 120 \text{ mg}$$

Question 18

$$d = 8\sqrt{\frac{305}{5}}$$
$$= 8 \times \sqrt{61}$$
$$= 62.48...$$
$$\approx 62 \text{ km}$$

Question 19

$$P = 450 + 0.11(2310 - 900)$$
$$= 450 + 0.11 \times 1410$$
$$= \$605.10$$

Question 20

$$
\begin{aligned}
d &= \frac{6(6+1)}{2} \\
&= \frac{6 \times 7}{2} \\
&= \frac{42}{2} \\
&= 21\,\text{m}
\end{aligned}
$$

Question 21

$$
\begin{aligned}
S &= 2\pi \times 3(3+8) \\
&= 2 \times \pi \times 3 \times 11 \\
&= 207.345... \\
&= 207.35\,\text{cm}^2
\end{aligned}
$$

Question 22

$$
\begin{aligned}
V &= \sqrt{2 \times 9.8 \times 6\,378\,000} \\
&= 11180.7333...
\end{aligned}
$$

$\therefore$ B

Question 1

a
$$3d + 2 = 20$$
$$3d = 18$$
$$d = 6$$

b
$$2p - 3 = 2$$
$$2p = 5$$
$$p = \frac{5}{2}$$
$$p = 2\tfrac{1}{2}$$

c
$$4u + 6 = 20$$
$$4u = 14$$
$$u = 3\tfrac{1}{2}$$

d
$$5a + 3 = -12$$
$$5a = -15$$
$$a = -3$$

e
$$12b + 8 = 4$$
$$12b = -4$$
$$b = \frac{-4}{12}$$
$$b = -\tfrac{1}{3}$$

f
$$3 - 2a = -6$$
$$-2a = -9$$
$$a = \frac{-9}{-2}$$
$$a = 4\tfrac{1}{2}$$

g
$$3m = m - 10$$
$$2m = -10$$
$$m = -5$$

h
$$\frac{3h}{4} = 9$$
$$3h = 36$$
$$h = 12$$

i
$$\frac{r-1}{6} = 2$$
$$r - 1 = 12$$
$$r = 13$$

j
$$\frac{-2x}{5} = 8$$
$$-2x = 40$$
$$x = -20$$

k
$$\frac{y+2}{-3} = 1$$
$$y + 2 = -3$$
$$y = -5$$

l
$$11 - 4n = 15$$
$$-4n = 4$$
$$n = \frac{4}{-4}$$
$$n = -1$$

m
$$5y + 6 = 4y + 11$$
$$5y = 4y + 5$$
$$y = 5$$

n
$$\frac{4c}{10} = 3$$
$$4c = 30$$
$$c = \frac{30}{4}$$
$$c = 7\tfrac{1}{2}$$

o
$$\frac{z}{3} - 11 = 9$$
$$\frac{z}{3} = 20$$
$$z = 60$$

Question 2

$2t-4=10+t$

$2t=14+t$

$t=14$

$\therefore$ D

Question 3

a $5k-13=3k+9$

$5k=3k+22$

$2k=22$

$k=11$

b $8e=2(e-6)$

$8e=2e-12$

$6e=-12$

$e=-2$

c $\dfrac{2f+7}{2}=10$

$2f+7=20$

$2f=13$

$f=6\frac{1}{2}$

d $3(x-2)=45$

$3x-6=45$

$3x=51$

$x=17$

e $\dfrac{w}{5}-8=6$

$\dfrac{w}{5}=14$

$w=70$

f $4(2d-9)=-12$

$8d-36=-12$

$8d=24$

$d=3$

g $\dfrac{4n+7}{9}=2$

$4n+7=18$

$4n=11$

$n=\dfrac{11}{4}$

$n=2\frac{3}{4}$

h $7u+7=2u-10$

$7u=2u-17$

$5u=-17$

$u=\dfrac{-17}{5}$

$u=-3\frac{2}{5}$

i $3p+4=4p$

$p=4$

j $\dfrac{5z+8}{6}=-3$

$5z+8=-18$

$5z=-26$

$z=\dfrac{-26}{5}$

$z=-5\frac{1}{5}$

k $\dfrac{8-2b}{2}=7$

$8-2b=14$

$-2b=6$

$b=\dfrac{6}{-2}$

$b=-3$

l $6(2-3q)=-24$

$12-18q=-24$

$-18q=-36$

$q=\dfrac{-36}{-18}$

$q=2$

Question 4

$\frac{c-4}{8}+2=6$

$\frac{c-4}{8}=4$

$\therefore$ Line 2

(as says =8 but should be =4)

$\therefore$ A

Question 1

a **i**

$m = 3s + 1$

$m = 3 \times 4 + 1$

$m = 13$

ii

$m = 3 \times 10 + 1$

$m = 31$

b **i**

$22 = 3s + 1$

$21 = 3s$

$s = 7$

ii

$55 = 3s + 1$

$54 = 3s$

$s = 18$

Question 2

$A = \frac{1}{2}bh$

$90 = \frac{1}{2} \times b \times 15$

$90 = 7\frac{1}{2}b$

$b = \frac{90}{7\frac{1}{2}}$

$b = 12 \text{ cm}$

Question 3

a

$s = \frac{d}{t}$

$15 = \frac{d}{20}$

$d = 15 \times 20$

$d = 300 \text{ m}$

b

$4.2 = \frac{250}{t}$

$4.2t = 250$

$t = \frac{250}{4.2}$

$t = 59.523...$

$t \approx 60 \text{ s}$

Question 4

$A = \frac{1}{2}(x + y)h$

$22.5 = \frac{1}{2}(x + 7) \times 5$

$\frac{22.5}{5} = \frac{1}{2}(x + 7)$

$4.5 = \frac{1}{2}(x + 7)$

$9 = x + 7$

$x = 2 \text{ m}$

Question 5

$$M = \frac{x+y+z}{3}$$
$$17 = \frac{x+10+20}{3}$$
$$17 = \frac{x+30}{3}$$
$$51 = x+30$$
$$x = 21$$

Question 6

$$C = 2\pi r$$
$$50.27 = 2\pi r$$
$$r = \frac{50.27}{2\pi}$$
$$r = 8.0007...$$
$$r \approx 8\,\text{cm}$$

Question 7

$$A = P(1+r)^n$$
$$6000 = P(1+0.11)^3$$
$$6000 = P \times 1.367631$$
$$P = \frac{6000}{1.367631}$$
$$P = 4387.148...$$
$$P \approx \$4387.15$$

Question 8

a $T = 18t + 28$

$$64 = 18t + 28$$
$$36 = 18t$$
$$t = 2\,\text{min}$$

b $92.8 = 18t + 28$

$$64.8 = 18t$$
$$t = \frac{64.8}{18}$$
$$t = 3.6\,\text{min}$$

Question 9

a

$K = 1.61M$

$5 = 1.61M$

$M = \dfrac{5}{1.61}$

$M = 3.105...$

$M = 3.11 \text{ miles}$

b

$1.5 = 1.61M$

$M = \dfrac{1.5}{1.61}$

$M = 0.9316...$

$M = 0.93 \text{ miles}$

Question 10

$c = 2t + 2$

a **i**

$c = 2 \times 5 + 2$

$c = 12$

ii

$c = 2 \times 12 + 2$

$c = 26$

b **i**

$24 = 2t + 2$

$22 = 2t$

$t = 11$

ii

$40 = 2t + 2$

$38 = 2t$

$t = 19$

Question 11

$852 = 540 + 0.12(v - 2000)$

$312 = 0.12(v - 2000)$

$\dfrac{312}{0.12} = v - 2000$

$2600 = v - 2000$

$v = \$4600$

Question 12

$58 = 2 \times 4 \times 2 + 2 \times 4 \times h + 2 \times 2 \times h$

$58 = 16 + 8h + 4h$

$58 = 16 + 12h$

$42 = 12h$

$h = \dfrac{42}{12}$

$h = 3\frac{1}{2}$

$\therefore \text{A}$

Question 13

$12 = \dfrac{5k}{8}$

$96 = 5k$

$k = \dfrac{96}{5}$

$k = 19.2 \text{ km}$

Question 14

$m = 2t + 1$

a $37 = 2t + 1$

$36 = 2t$

$t = 18$

b $55 = 2t + 1$

$54 = 2t$

$t = 27$

Question 15

$46 = 18 + 14(h - 1)$

$28 = 14(h - 1)$

$2 = h - 1$

$h = 3 \text{ hours}$

Question 16

$F = 32 - 2t$

a **i** $F = 32 - 2 \times 8$

$F = 16 \text{ th}$

ii $F = 32 - 2 \times 14$

$F = 4 \text{ th}$

b **i** $18 = 32 - 2t$

$-14 = -2t$

$t = \dfrac{-14}{-2}$

$t = 7 \text{ seconds}$

ii $8 = 32 - 2t$

$-24 = -2t$

$t = \dfrac{-24}{-2}$

$t = 12 \text{ seconds}$

Question 17

$14\frac{1}{2} = 8 + \dfrac{18 - a}{2}$

$6\frac{1}{2} = \dfrac{18 - a}{2}$

$13 = 18 - a$

$-5 = -a$

$a = 5$

$\therefore \text{D}$

Question 18

$44 = 8 + a \times 12$

$44 = 8 + 12a$

$36 = 12a$

$a = 3 \text{ m/s}^2$

Exercise 2.06 Changing the subject of a formula

Question 1

a

$$y = 2x + 4$$
$$2x + 4 = y$$
$$2x = y - 4$$
$$x = \frac{y-4}{2}$$

b

$$T = 3x - 7$$
$$3x - 7 = T$$
$$3x = T + 7$$
$$x = \frac{T+7}{3}$$

c

$$d = \frac{x+1}{3}$$
$$\frac{x+1}{3} = d$$
$$x + 1 = 3d$$
$$x = 3d - 1$$

d

$$p = 18 - x$$
$$18 - x = p$$
$$-x = p - 18$$
$$x = \frac{p-18}{-1}$$
$$x = -p + 18$$
$$x = 18 - p$$

e

$$k = 4x + r$$
$$4x + r = k$$
$$4x = k - r$$
$$x = \frac{k-r}{4}$$

f

$$C = n + \frac{x}{2}$$
$$n + \frac{x}{2} = C$$
$$\frac{x}{2} = C - n$$
$$x = 2(C - n)$$

g

$$S = 10bx$$
$$10bx = S$$
$$x = \frac{S}{10b}$$

h

$$V = \frac{x-5}{6}$$
$$\frac{x-5}{6} = V$$
$$x - 5 = 6V$$
$$x = 6V + 5$$

i

$$z = 12 - ax$$
$$12 - ax = z$$
$$-ax = z - 12$$
$$x = \frac{z-12}{-a}$$
$$x = \frac{12-z}{a}$$

Question 2

a

$$S = \frac{d}{t}$$
$$\frac{d}{t} = S$$
$$d = St$$

b

$$S = \frac{d}{t}$$
$$St = d$$
$$t = \frac{d}{S}$$

Question 3

a

$$\begin{aligned} A &= 180(n-2) \\ &= 180 \times (12-2) \\ &= 1800 \end{aligned}$$

$\therefore$ The angle sum is 1800°.

b

$$A = 180(n-2)$$

$$180(n-2) = A$$

$$n-2 = \frac{A}{180}$$

$$n = \frac{A}{180} + 2$$

c

$$\begin{aligned} n &= \frac{A}{180} + 2 \\ &= \frac{1260^\circ}{180} + 2 \\ &= 9 \end{aligned}$$

$\therefore$ It has 9 sides.

Question 4

$$V = \frac{1}{3}Ah$$

$$\frac{1}{3}Ah = V$$

$$Ah = 3V$$

$$A = \frac{3V}{h}$$

$\therefore$ D

Question 5

a

$$A = \frac{1}{2}(a+b)h$$

$$\frac{1}{2}(a+b)h = A$$

$$(a+b)h = 2A$$

$$h = \frac{2A}{a+b}$$

b

$$A = \frac{1}{2}(a+b)h$$

$$\frac{1}{2}(a+b)h = A$$

$$(a+b)h = 2A$$

$$a+b = \frac{2A}{h}$$

$$b = \frac{2A}{h} - a$$

Question 6

a

$$A = \pi r^2$$
$$\pi r^2 = A$$
$$\pi = \frac{A}{r^2}$$

b

$$y = mx + c$$
$$mx + c = y$$
$$mx = y - c$$
$$m = \frac{y - c}{x}$$

c

$$v^2 = u^2 + 2as$$
$$u^2 + 2as = v^2$$
$$2as = v^2 - u^2$$
$$s = \frac{v^2 - u^2}{2a}$$

d

$$z = \frac{x - m}{s}$$
$$\frac{x - m}{s} = z$$
$$x - m = sz$$
$$x = sz + m$$

e

$$E = mc^2$$
$$mc^2 = E$$
$$m = \frac{E}{c^2}$$

f

$$K = \frac{1}{2}mv^2$$
$$\frac{1}{2}mv^2 = K$$
$$mv^2 = 2K$$
$$m = \frac{2K}{v^2}$$

g

$$A = P(1 + r)^n$$
$$P(1 + r)^n = A$$
$$P = \frac{A}{(1 + r)^n}$$

h

$$x = 6y + 3$$
$$6y + 3 = x$$
$$6y = x - 3$$
$$y = \frac{x - 3}{6}$$

i

$$A = \frac{1}{2}bh$$
$$\frac{1}{2}bh = A$$
$$bh = 2A$$
$$h = \frac{2A}{b}$$

j

$$T^2 = \frac{4\pi^2 l}{g}$$
$$\frac{4\pi^2 l}{g} = T^2$$
$$4\pi^2 l = T^2 g$$
$$l = \frac{T^2 g}{4\pi^2}$$

k

$$V = IR - E$$
$$IR - E = V$$
$$IR = V + E$$
$$R = \frac{V + E}{I}$$

l

$$e = ir + \frac{Q}{C}$$
$$ir + \frac{Q}{C} = e$$
$$\frac{Q}{C} = e - ir$$
$$Q = C(e - ir)$$

m

$$s = ut + \frac{1}{2}at^2$$
$$ut + \frac{1}{2}at^2 = s$$
$$\frac{1}{2}at^2 = s - ut$$
$$at^2 = 2(s - ut)$$
$$a = \frac{2(s - ut)}{t^2}$$

n

$$K = \frac{m + d}{w}$$
$$\frac{m + d}{w} = K$$
$$m + d = Kw$$
$$d = Kw - m$$

Question 7

Rearrange to get m as the subject:

$$B = \frac{m}{h^2}$$
$$\frac{m}{h^2} = B$$
$$m = Bh^2$$

If $B = 25$ and $h = 1.55$,

$$m = Bh^2$$
$$= 25 \times 1.55^2$$
$$= 60.0625$$
$$\approx 60$$

$\therefore$ The mass would be 60 kg.

Question 8

If $V = \frac{1}{3}\pi r^2 h$

$$\frac{1}{3}\pi r^2 h = V$$
$$\pi r^2 h = 3V$$
$$\therefore\ h = \frac{3V}{\pi r^2} \text{ as required.}$$

So, if $V = 3539.53 \text{ cm}^3$ and $r = 13$ cm;

$$h = \frac{3V}{\pi r^2}$$
$$= \frac{3 \times 3539.53}{\pi \times 13^2}$$
$$= 20.000... \text{ cm}$$
$$= 20 \text{ cm}$$

$\therefore$ The height of the cone is 20 cm.

Question 9

$$C = \frac{5}{9}(F - 32)$$

$$\frac{5}{9}(F - 32) = C$$

$$F - 32 = \frac{9C}{5}$$

$$F = \frac{9C}{5} + 32$$

a If $C = 40$,

$$F = \frac{9C}{5} + 32$$

$$= \frac{9 \times 40}{5} + 32$$

$$= 104$$

b If $C = 100$,

$$F = \frac{9C}{5} + 32$$

$$= \frac{9 \times 100}{5} + 32$$

$$= 212$$

Question 10

$$M = \frac{10}{\pi hP}$$

$$\pi hPM = 10$$

$$\therefore P = \frac{10}{\pi hM}$$

If $M = 9.8$ and $h = 0.27$,

$$P = \frac{10}{\pi hM}$$

$$= \frac{10}{\pi \times 0.27 \times 9.8}$$

$$= 1.202...$$

$$\approx 1.2$$

Sample HSC problem

a $C = 60 + 32(h - 1)$

$= 60 + 32(2\frac{1}{2} - 1)$

$= 60 + 32 \times 1\frac{1}{2}$

$= \$108$

b $C = 60 + 32h - 32$

$= 28 + 32h$

$C - 28 = 32h$

$h = \dfrac{C - 28}{32}$

c $172 = 60 + 32(h - 1)$

$112 = 32(h - 1)$

$\dfrac{112}{32} = h - 1$

$h - 1 = 3\frac{1}{2}$

$h = 4\frac{1}{2}$ hours

Question 1

a $2t^2 - t^2 + 5ut + 4ut = t^2 + 9ut$

b $3 \times 5 \times k^2 \times k = 15k^3$

c $\frac{-9 \times 2}{3} \times d \times d = -6d^2$

d $8 \times 4 \times p^2 \times p^3 = 32p^5$

e $4h - 10h - 1 + 8 = -6h + 7$

f $8r^2$

g $-3d^2 \times \left(-3d^2\right) \times \left(-3d^2\right) = -27d^6$

h $\frac{3}{5}$

i $\frac{-3}{21} \times \frac{v^2w^2}{vw} = -\frac{vw}{7}$

j $10x^2 - 2x^2 + 7x + x = 8x^2 + 8x$

k $\frac{3c}{b}$

l $-\frac{1}{a^2}$

m $\frac{48r}{6} \times \frac{1}{4r} = 8r \times \frac{1}{4r} = 2$

n $\frac{2y}{3} \times \frac{v}{1} = \frac{2vy}{3}$

o $\frac{x}{6} \times \frac{1}{2} = \frac{x}{12}$

p $\frac{3y}{2a} \times \frac{10d}{9dy} = \frac{1}{a} \times \frac{5}{3}$

$= \frac{5}{3a}$

Question 2

a $5\times 2x-5\times 4=10x-20$

b $-3\times a+(-3)\times 7=-3a-21$

c $4\times 12t-4\times y=48t-4y$

d $-9\times r^2+(-9)\times 2w=-9r^2-18w$

e $8mn\times m-8mn\times n=8m^2n-8mn^2$

f $-2d\times 4d-\left(-2d\right)\times d^2=-8d^2+2d^3$

Question 3

a $12x+3+2x-4=14x-1$

b $2n^2-2n+n-1=2n^2-n-1$

c $12-6d-4d+12=24-10d$

d $p^2+4p-p^2-8p=-4p$

e $12u+15-u-7=11u+8$

f $5h^2-h+3h^2+27h=8h^2+26h$

Question 4

a $3\times 4^2+4\times 20=48+80$

$=128$

b $\dfrac{7\times 20}{-5}=\dfrac{140}{-5}$

$=-28$

c $4\times\left(-5\right)\times 20=-400$

d $\sqrt{4\left(20-\left(-5\right)\right)}=\sqrt{4\times 25}$

$=\sqrt{100}$

$=10$

Question 5

$S=\pi\times 5\left(5+8\right)$

$=\pi\times 5\times 13$

$=204.203...$

$\approx 204.20\ \text{cm}^2$

Question 6

$$P = 480 + \frac{3400 - 1200}{10}$$
$$= 480 + \frac{2200}{10}$$
$$= 480 + 220$$
$$= \$700$$

Question 7

a
$$5p - 4 = 21$$
$$5p = 25$$
$$p = 5$$

b
$$-2a + 6 = 8$$
$$-2a = 2$$
$$a = \frac{2}{-2}$$
$$a = -1$$

c
$$\frac{b-3}{2} = -6$$
$$b - 3 = -12$$
$$b = -9$$

d
$$23 - 8r = 19$$
$$-8r = -4$$
$$r = \frac{-4}{-8}$$
$$r = \frac{1}{2}$$

e
$$\frac{4n}{5} = 11$$
$$4n = 55$$
$$n = \frac{55}{4}$$
$$n = 13\tfrac{3}{4}$$

f
$$\frac{r}{3} + 7 = 1$$
$$\frac{r}{3} = -6$$
$$r = -18$$

g
$$\frac{20 - 4n}{4} = 7$$
$$20 - 4n = 28$$
$$-4n = 8$$
$$n = \frac{8}{-4}$$
$$n = -2$$

h
$$3t + 13 = t - 12$$
$$3t = t - 25$$
$$2t = -25$$
$$t = -12\tfrac{1}{2}$$

i
$$5(2g - 4) = -30$$
$$10g - 20 = -30$$
$$10g = -10$$
$$g = -1$$

Question 8

$28^2 = 11^2 + 2 \times 3 \times s$

$784 = 121 + 6s$

$663 = 6s$

$s = 110.5 \text{ m}$

Question 9

$13 = \frac{c}{8} + 3$

$10 = \frac{c}{8}$

$c = 80$

Question 10

$P = 110 + \frac{y}{2}$

$P - 110 = \frac{y}{2}$

$y = 2P - 220$

$y = 124 \times 2 - 220$

$y = 28 \text{ years}$

