Grade 11 Nov P1 150 08.11.2024

1.1.1. $x^2 - 2x - 8 = 0$

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

$\therefore x = 4$ or -2 ✓ ✓ ao 2/2 (2)

1.1.2. $2x^2 - 3x = 7$

$2x^2 - 3x - 7 = 0$ ✓

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-7)}}{2(2)}$ ✓

$= \frac{3 \pm \sqrt{65}}{4}$

$= 2,77$ or $-1,27$ ✓ ✓ (4)

1.1.3 $(x+1)(4-x) > 0$

CV: $(x+1)(4-x) = 0$

$\therefore x = -1$ or 4 ✓

$\frac{(x+1)(4-x)}{x}$: $-$ | 0 (−1) | $+$ | 0 (4) | $-$

$-1 < x < 4$ ✓

but $x \in \mathbb{N}$

$\therefore x = 1; 2$ or 3 ✓ (3)

1.2. $\frac{14}{p} = p + 5$

1.2.1. LCD: p $(\therefore p \neq 0)$

x thru

$14 = p^2 + 5p$

$0 = p^2 + 5p - 14$ ✓

$0 = (p-2)(p+7)$ ✓

$\therefore p = 2$ ✓ or -7 (3)

1.2.2. $p = \sqrt{x+5}$

$2 = \sqrt{x+5}$ ✓ or $-7 = \sqrt{x+5}$

$()^2$ bs no soln ✓

$4 = x + 5$ ✓

$-1 = x$ ✓ (4)

13. $-3y = 1 - x$

$x^2 - 2xy - y^2 - 7 = 0$

$x = 1 + 3y$ ✓

$(1+3y)^2 - 2(1+3y)y - y^2 - 7 = 0$ ✓

$1 + 6y + 9y^2 - 2(y + 3y^2) - y^2 - 7 = 0$

$1 + 6y + 9y^2 - 2y - 6y^2 - y^2 - 7 = 0$

$2y^2 + 4y - 6 = 0$

$\div 2$: $y^2 + 2y - 3 = 0$ ✓

$(y - 1)(y + 3) = 0$ ✓

$\therefore$ $y = 1$ or -3 ✓

$\therefore$ $x = 1 + 3(1)$ or $1 + 3(-3)$

$= 4$ $= -8$ ✓

(6)

14. $2x^{-1} + x^{-2} = 3$

$x^{-2} + 2x^{-1} - 3 = 0$

$(x^{-1} - 1)(x^{-1} + 3) = 0$ ✓

$\therefore$ $x^{-1} = 1$ or -3

$(x^{-1})^{-1} = (1)^{-1}$ or $(-3)^{-1}$

$x =$ ✗ ✓ $= -\frac{1}{3}$

reject $x < 0$ selection

$\therefore$ $2(6x - 1)^{-1}$

$= \frac{2}{6x - 1}$

$= \frac{2}{6(-\frac{1}{3}) - 1}$ ✓ sub

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

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

$= -\frac{2}{3}$ ✓ (4)

OR

$2x^{-1} + x^{-2} = 3$

$\frac{2}{x} + \frac{1}{x^2} = 3$

LCD $= x^2$ $(\therefore x \neq 0)$

x thru

$2x + 1 = 3x^2$

$0 = 3x^2 - 2x + 1$ ✓

$= (3x + 1)(x - 1)$

$\therefore$ $x = -\frac{1}{3}$ or ✗

✓ selection reject $x < 0$

$\therefore$ $2(6x - 1)^{-1}$

etc as before.

2.1 $\dfrac{\sqrt{32}-\sqrt{18}+3\sqrt{3}}{\sqrt{108}+\sqrt{8}}$

$\sqrt{32} = \sqrt{16.2}$
$= 4\sqrt{2}$

$\sqrt{18} = \sqrt{9.2}$
$= 3\sqrt{2}$ ✓

$\sqrt{108} = \sqrt{36.3}$
$= 6\sqrt{3}$

$\sqrt{8} = \sqrt{4.2}$
$= 2\sqrt{2}$

$\therefore \dfrac{4\sqrt{2}-3\sqrt{2}+3\sqrt{3}}{6\sqrt{3}+2\sqrt{2}}$ ✓

$= \dfrac{\sqrt{2}+3\sqrt{3}}{2(3\sqrt{3}+\sqrt{2})}$ ✓

$= \dfrac{1}{2}$ ✓ (4)

2.2.1 $2x^{-5/2} = 64$ isolate

$x^{-5/2} = 32$ ✓

$\left(x^{-5/2}\right)^{-2/5} = (32)^{-2/5}$ ✓ method

$x = \dfrac{1}{4}$ ✓ (3)

2.2.2 $3.5^x - 5^{x-1} = 14$

✓ $3.5^x - 5^x.5^{-1} = 14$

✓ $5^x\left(3-5^{-1}\right) = 14$

$5^x\left(3-\frac{1}{5}\right) = 14$

$5^x . \frac{14}{5}$ ✓ $= 14$

$5^x = 5$ ✓

$x = 1$ ✓ (5)

2.3 $\sqrt{a}+\sqrt{b} = \sqrt{9+\sqrt{56}}$

( )^2 bs

$(\sqrt{a}+\sqrt{b})^2 = (\sqrt{9+\sqrt{56}})^2$

$a+2\sqrt{a}\sqrt{b}+b$ ✓ $= 9+\sqrt{56}$

$a+b+2\sqrt{ab} = 9+\sqrt{56}$

$a+b = 9$ ✓ $\quad 2\sqrt{ab} = \sqrt{56}$

( )^2 bs

$(2\sqrt{ab})^2 = (\sqrt{56})^2$

$4ab = 56$

$ab = 14$ ✓

$a = 9-b \quad (9-b)b = 14$

$9b-b^2 = 14$

$0 = b^2-9b+14$

$= (b-7)(b-2)$

either a, b ✓ $\therefore b = 7$ or 2

$\therefore a = 9-7$ or $9-2$

$= 2 \quad = 7$

$\therefore a^2+b^2 = (2)^2+(7)^2$

$= 53$ ✓ (5)

3.1 $-5 ; -9 ; -13$

$-4 \quad -4$ ✓ ✓

3.1.1 $-17 ; -21$ ✓ ✓ (2)

3.1.2. $a = -5 \qquad d = -4$

$T_n = -5 + (n-1)(-4)$

$= -5 + (-4n + 4)$

$= -5 - 4n + 4$

$= -4n - 1$ (2)

✓ ✓

3.1.3. $T_n = -141$ ✓

$-4n - 1 = -141$

$n = 35$ ✓ (2)

3.2. $x ; T_2 ; T_3$

$x - 5$ ✓

$T_2 = x + x - 5$

$= 2x - 5$ ✓

$T_3 = 2x - 5 + x - 5$

$= 3x - 10$ ✓

$T_1 + T_2 + T_3 = 63$

$x + 2x - 5 + 3x - 10 = 63$ ✓

$6x = 78$ ✓

$x = 13$ ✓

(5)

$\therefore T_1 = 13$

4.1. 24 ; 10 ; 0 ; -6 ; ...

-14 -10 -6 ✓

4 4 ✓

Second difference is constant ∴ the original number pattern is quadratic. (2)

4.2. $d_2 = 2a$ $3a+b = d_1$ $a+b+c = T_1$

$4 = 2a$ $3(2)+b = -14$ $2-20+c = 24$

$2 = a$ ✓ $b = -20$ ✓ $c = 42$ ✓

$\therefore T_n = 2n^2 - 20n + 42$ ✓ (4)

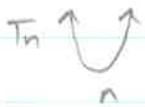
4.3. $T_{52} = 2(52)^2 - 20(52) + 42$ ✓

$= 4410$ ✓ (2)

4.4. $T_n = 2n^2 - 20n + 42$

$n = \frac{-(-20)}{2(2)}$

$= 5$ ✓



$\therefore T_5 = 2(5)^2 - 20(5) + 42$ ✓

$= -8$ ✓ (3)

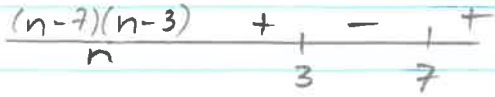
4.5. $T_n = 2n^2 - 20n + 42$

$T_n > 0$

$2n^2 - 20n + 42 > 0$ ✓

$\div 2: \quad n^2 - 10n + 21 > 0$

$(n-7)(n-3) > 0$ ✓



$n < 3$ or $7 < n$

but $n \in \mathbb{N}$

$1 \leq n < 3$ or $7 < n$; $n \in \mathbb{N}$ ✓ ✓ (4)

OR

$0 < n < 3$ ...

OR

... $8 \leq n$

OR

$1 \leq n \leq 2$ ...

5. $f: y = \frac{-3}{x+p} + q$

5.1. $y = -x+4 \quad y = x-2$

$-x+4 = x-2$ ✓

$6 = 2x$

$3 = x$ ✓

$y = 3-2$

$= 1$ ✓

$\therefore$ va: $x = 3$

ha: $y = 1$

$\therefore y = \frac{-3}{x-3} + 1$ ✓

$y = \frac{-3}{x+p} + q$

$\therefore p = -3$ and $q = 1$ (4)

f $y = \frac{-3}{x-3} + 1$

5.2. x int: $0 = \frac{-3}{x-3} + 1$ ✓

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

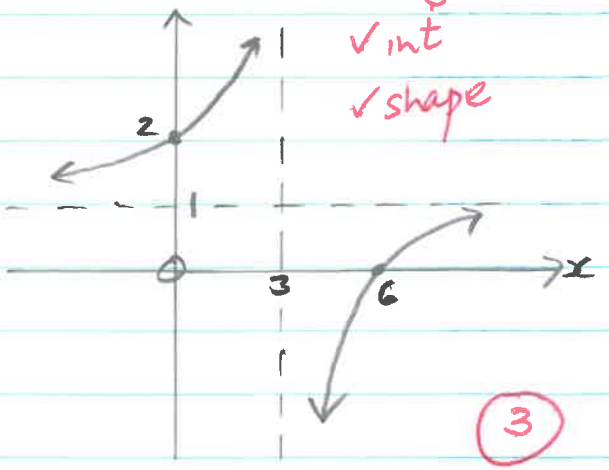
$3 = x - 3$

$6 = x$ ✓ (2)

5.3. y int: $y = \frac{-3}{0-3} + 1$ ✓

$= 2$ ✓ (2)

5.4.



✓asy ✓int ✓shape (3)

shape $k = -3$ $\therefore$ ⌣ + ⌢

5.5. $x = 0$ y axis !!!

$\therefore y = \frac{-3}{-x-3} + 1$

$= \frac{-3}{-(x+3)} + 1$

$= \frac{3}{x+3} + 1$ ✓

$D_g: x \in \mathbb{R}; x \neq -3$ ✓ ✓ (3)

5.6. $x \quad f(x) \leq 0$

$x \quad y_f \quad \underline{0}$

✓ int ✓ not n

$x \in (-\infty; 0]$ or $(3; 6]$ (3)

5.1. AOS $y = -x + 4$ $y = x - 2$

$$y = \frac{-3}{x+p} + q$$

$y = x + p + q$ $y = -(x+p) + q$

$= -x - p + q$

$y = x - 2$ $y = -x + 4$

$p + q = -2$ ✓ both $-p + q = 4$

... 1 ... 2

(1) : $p = -2 - q$ ✓

(2) : $-(-2-q) + q = 4$ ✓

$2 + q + q = 4$

$2q = 2$

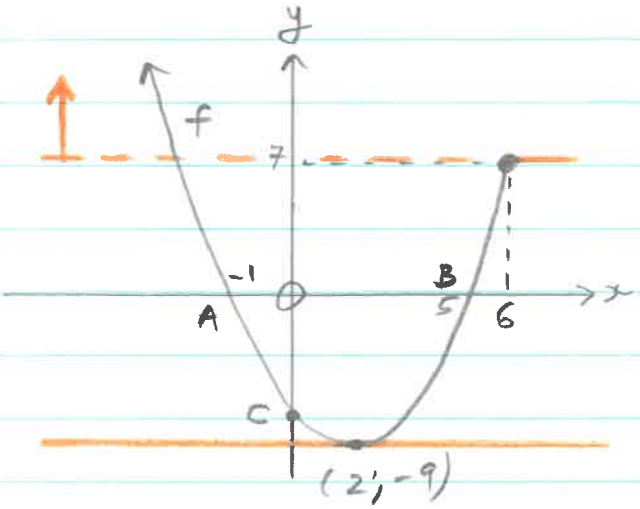
$q = 1$

$p = -2 - (1)$ ✓

$= -3$

(4)

6.



f: $y = x^2 - 4x - 5$

6.1. $f(x) = x^2 - 4x - 5$

$f(6) = (6)^2 - 4(6) - 5$

$= 7$ ✓ (1)

6.2 x-int: $0 = x^2 - 4x - 5$

$= (x-5)(x+1)$ ✓

$\therefore x = 5$ or -1

A(-1; 0) ✓ B(5; 0) ✓ (3)

6.3. $AB = 5 - (-1)$

$= 6$ ✓ (1)

6.4 f: $y = x^2 - 4x - 5$ $x \in (-\infty; 6]$

$2 \rightarrow y = (x-2)^2 - 4(x-2) - 5$ ✓

$x \in (-\infty; 8]$

$5 \uparrow$ $y = x^2 - 4x + 4 - 4x + 8 - 5 + 5$ ✓

$= x^2 - 8x + 12$ ✓ (3)

$\therefore g(x) = x^2 - 8x + 12$; $x \in (-\infty; 8]$

6.5. $y = x^2 - 4x - 5$ f

$y = -2x + t$ h tan

$\cap$: $x^2 - 4x - 5 = -2x + t$ ✓

$x^2 - 2x - 5 - t = 0$ ✓

$\Delta = (-2)^2 - 4(1)(-5-t)$

$= 4 + 20 + 4t$

$= 4t + 24$ ✓

tan $\Delta = 0$

$4t + 24 = 0$ ✓

$t = -6$ ✓ (5)

6.6. tp: $x = \frac{-1+5}{2}$ $y = (2)^2 - 4(2) - 5$

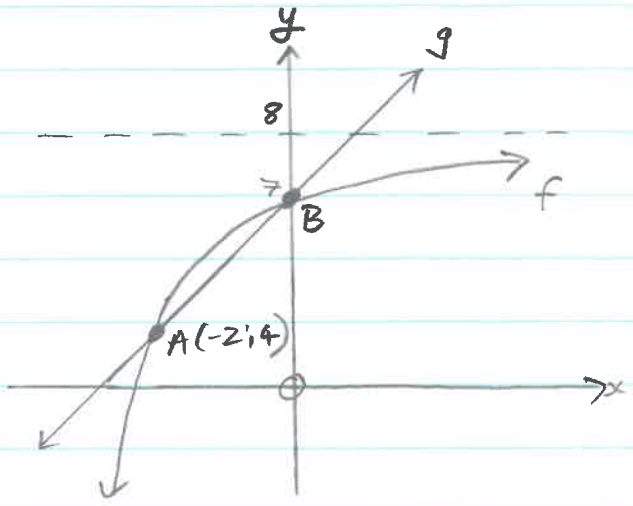
$= 2$ $= -9$

$(2; -9)$ ✓

$f(x) - k = 0$

$f(x) = k$

$k = -9$ ✓✓ or $k > 7$ ✓ (4)

7. 

f: $y = -b^x + 8$

g: $y = \frac{3}{2}x + 7$

7.1. B(0; 7) ✓ (1)

7.2. $y = -b^x + 8$

sub A(-2; 4)

$4 = -b^{-2} + 8$ ✓

$b^{-2} = 4$

$(b^{-2})^{-\frac{1}{2}} = \pm(4)^{-\frac{1}{2}}$ ✓ rej −

$b = \frac{1}{2}$ (2)

7.3. f: av grad $= \frac{3}{2}$ ✓✓ (2)

7.4. ha: $y = 8$ ✓ (1)

7.5. f: $y = -(\frac{1}{2})^x + 8$

g: $y = \frac{3}{2}x + 7$

$y_f = -(\frac{1}{2})^{-1} + 8$ ✓ $= 6$ ✓

$y_g = \frac{3}{2}(-1) + 7$ ✓ $= \frac{11}{2}$ 5,5

"FG" $= y_f - y_g$

$= 6 - \frac{11}{2}$

$= \frac{1}{2}$ ✓ 0,5 (3)

7.6. f: $y = -(\frac{1}{2})^x + 8$

- reflect in x-axis ✓

$-y = -(\frac{1}{2})^x + 8$

$y = (\frac{1}{2})^x - 8$

- move/translate 3 units vertically upwards ✓

$y = (\frac{1}{2})^x - 8 + 3$

h: $y = (\frac{1}{2})^x - 5$ (2)

7.7. $f(x) \geq g(x)$

$y_f \geq y_g$

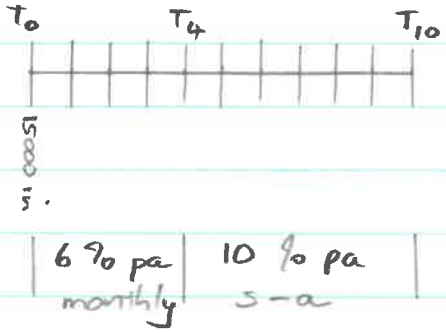
$x \in [-2; 0]$ ✓int ✓notn (2)

8.1. $A = P(1-i)^n$ ✓i

$= 14500\left(1 - \frac{13}{100}\right)^5$ ✓sub

$= R\ 7\ 227,10$ ✓ (3)

8.2.



8.2.1. $1 + i_{ea} = \left(1 + \frac{i_{nom}}{k}\right)^k$

- $1 + i_{ea} = \left(1 + \frac{6}{1200}\right)^{12}$ ✓

  $i_{ea} = 0,06\ldots$

  $I_{ea} = 6,1678\ \%$ ✓

- $1 + i_{ea} = \left(1 + \frac{10}{200}\right)^2$ ✓

  $i_{ea} = 0,10\ldots$

  $I_{ea} = 10,25\ \%$ ✓ (4)

8.2.2 $T_0 - T_4$ i,n ✓

$A = 15000\left(1 + \frac{6}{1200}\right)^{4\times12}$ ✓sub

$= 19\,057,33\ldots$

$T_4 - T_{10}$ i,n ✓

$A = 19057,33\ldots\left(1 + \frac{10}{200}\right)^{6\times2}$

$= R\ 34\ 224,24$ ✓ (4)

OR i,n ✓ i,n ✓

sub ✓

$A = 15000\left(1 + \frac{6,1678}{100}\right)^4\left(1 + \frac{10,25}{100}\right)^6$

$= R\ 34\ 224,26$ ✓ (4)

8.2.3. $15000\left(1+\frac{6}{1200}\right)^{48}\left(1+\frac{x}{400}\right)^8\left(1+\frac{x}{200}\right)^8 = 48\,597,03$ ✓

$\left(\frac{400+x}{400}\right)^8\left(\frac{200+x}{200}\right)^8 = 2,56\ldots$ ✓

$\left(\frac{400+x}{400}\cdot\frac{200+x}{200}\right)^8 = 2,56\ldots$

$\sqrt[8]{\quad}$ bs

$\frac{(400+x)(200+x)}{80\,000} = \sqrt[8]{2,56\ldots}$

$80\,000 + 600x + x^2 = 90\,000,..$

$x^2 + 600x - 10\,000,002\ldots = 0$ ✓

$x = \frac{-(600) \pm \sqrt{(600)^2 - 4(1)(-10\,000,002\ldots)}}{2(1)}$ ✓

$= \frac{-600 \pm \sqrt{400\,000,008\ldots}}{2}$

$= \frac{-600 \pm 632,45\ldots}{2}$

reject

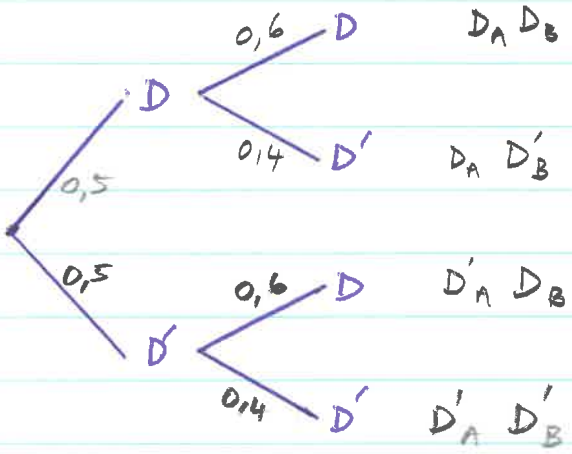
$= 16,23$ or $-616,23$

$\therefore x = 16,23\ \%$ ✓ (5)

Yho !!!

$\sqrt[8]{2,56\ldots} = 1,125$

9.1 A = front
B = back



9.1.1 $P(D \geq 1)$
$= 1 - P(D_A' D_B')$ ✓
$= 1 - 0,5 \cdot 0,4$ ✓ (3)
$= \frac{4}{5}$ ✓ 0,8

OR

$P(D \geq 1)$
$= P(D_A D_B) + P(D_A D_B') + P(D_A' D_B)$
$= 0,5 \times 0,6 + 0,5 \times 0,4 + 0,5 \times 0,6$
$= \frac{4}{5}$ 0,8

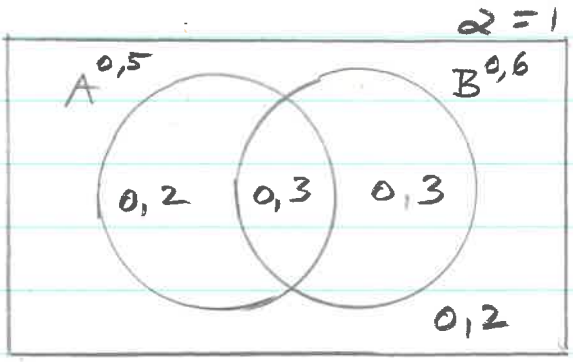
9.1.2. $P(D')$
$= P(D_A' D_B')$
$= 0,5 \times 0,4$ ✓
$= \frac{1}{5}$ ✓ (2)

9.2.1. $26+9+12+24+4+15+x+12 = 110$ ✓✓
$\therefore 102 + x = 110$
$x = 8$ (2)

9.2.2. $P(1 \text{ only})$
$= \frac{26 + 24 + 15}{110}$
$= \frac{65}{110}$ ✓num ✓den (2)
$= \frac{13}{22}$

9.2.3. $P(M \cap A \text{ but } S')$
$= \frac{12}{110}$ ✓num ✓den (2)
$= \frac{6}{55}$

9.1.1. (OR) A / B detected by A / B



Independent cameras : P(A and B) = P(A) × P(B)
= 0,5 × 0,6
= 0,3 ✓

P (≥ 1 camera)
= P (A only or B only or A and B)
= P (A or B)
= 0,2 + 0,3 + 0,3 ✓
= 0,8 ✓

9.1.2 P(D')
= 1 − 0,8 ✓
= 0,2 ✓

OR

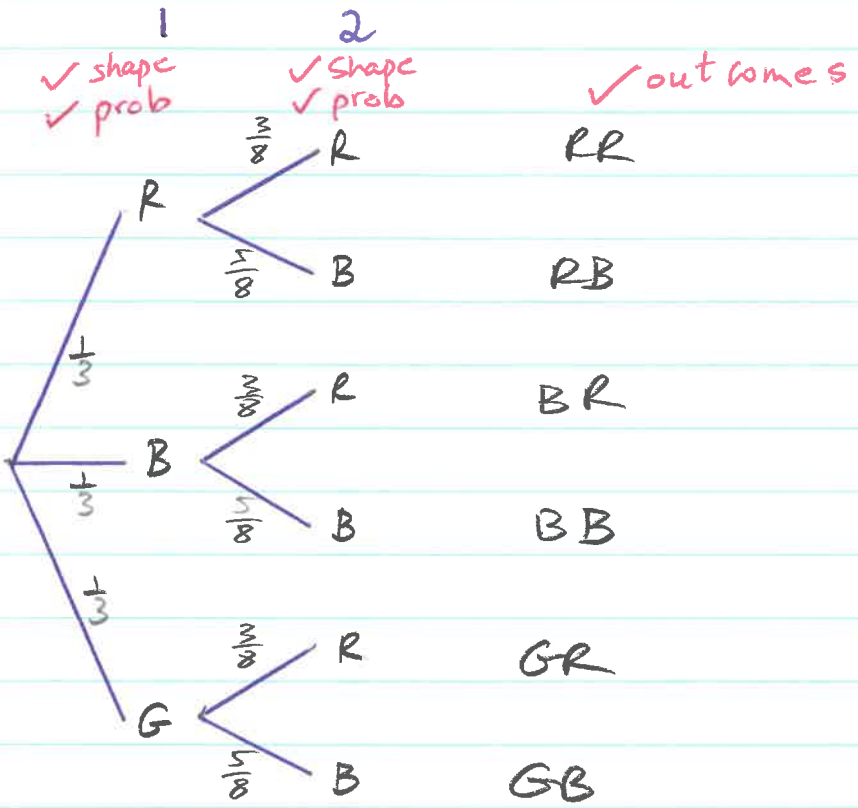
9.1.1 $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

independent

$P(A \text{ or } B) = 0{,}5 + 0{,}6 - 0{,}5 \times 0{,}6$

$= \frac{4}{5}$

10.



P(same colour)

$= P(RR) + P(BB)$

$= \frac{1}{3} \cdot \frac{3}{8} + \frac{1}{3} \cdot \frac{5}{8}$

$= \frac{1}{8}$ ✓ $+ \frac{5}{24}$ ✓

$= \frac{1}{3}$ ✓

8