Test

Name: Maanya
Start: 10:05
End: 11:07

1. N/A

2.
a) 1 5 10 10 5 1 ✓ A2

b) $(2x+3)^5 = (2x)^5 + 5(2x)^4(3) + \boxed{10(2x)^3(3^2)}$

$10 \cdot 8 \cdot 9 \cdot x^3$ ✓ M1A1A1A1

$= \underline{720x^3}$ ✓ A1

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3. N/A

4. $\left(2x^2 + \dfrac{1}{2x^3}\right)^{10}$

$T_{r+1} = \binom{10}{r}(2x^2)^{10-r} \cdot \left(\dfrac{1}{2x^3}\right)^r$ ✓ M1

$(x^2)^{10-r} \cdot (x^{-3})^r = x^0$ ✓

$x^{20-2r} \cdot x^{-3r} = x^0$ ✓

$x^{20-5r} = x^0$ ✓

$20 - 5r = 0$

$20 = 5r$

$r = \cancel{} 4$ ✓

$\binom{10}{4}(2x^2)^6\left(\dfrac{1}{2x^3}\right)^4$ ✓ A1A1A1

$\dfrac{10 \times 9 \times 8 \times 7}{} $

$= \dfrac{10!}{4!(6!)}$ $= 210 \cdot \cancel{64} \cdot \dfrac{1}{16}$ ✓

$\dfrac{4 \times 3 \times 2 \times 1}{1}$ $= \underline{840}$ ✓ A1

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5. N/A

6. N/A

7. $\left(\dfrac{2}{3}x - 3\right)^8$

$T_{r+1} = \dbinom{8}{r}\left(\dfrac{2}{3}x\right)^{8-r}(-3)^r$ M1

$x^{8-r} = x^3$

$r = 5$

$T_{5+1} = \dbinom{8}{5}\left(\dfrac{2}{3}x\right)^3(-3)^5$ A1A1A1

$56 \cdot \dfrac{8}{27} \cdot -243$

$= -4032x^3$ A1

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6. $(ax^3 + b)^8$

$T_{r+1} = \dbinom{8}{r}(ax^3)^{8-r}(b)^r$ M1

$x^{24-3r} = x^6$

$-3r = -18$

$r = 6$ A1

$\dbinom{8}{6}(a^2)(b^6) = 448$

$(a^2)(b^6) = 16$ A1A1

$(ax^3 + b)^{10}$

$T_{r+1} = \dbinom{10}{r}(ax^3)^{10-r}(b)^r$

$x^{30-3r} = x^6$

$-3r = -24$

$r = 8$

$$\binom{10}{8}(a^2)(b^8) = 2880 \quad \text{M1}$$

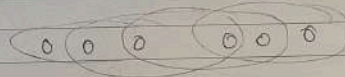$$(a^2)(b^8) = 64$$

$$a^2 b^6 = 16$$

$$a^2 b^8 = 64$$

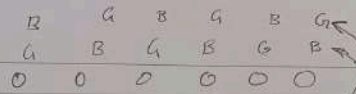$$b = 2 \quad a = \frac{1}{2} \quad \text{A1A1}$$

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9.

a)

3 girls can be arranged in
3! ways so 6 ways   A1

and then 4 ways they can sit: 4!   M1

$$3! \times 4! = 144 \quad \text{A1}$$

B	G	B	G	B	G
G	B	G	B	G	B

b)
$$0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$$

↙girls ↙boys
$$3! \times 3! \times 2 \text{ ways} \quad \text{M1A1}$$

$$= 72 \text{ ways} \times 2 \quad \text{M1}$$

$$= 144 \text{ ways} \quad \text{A1}$$

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10.

a) $15!$ ← boys $10!$ ← girls   A1

$$15! \times 10! \times 2 \quad \leftarrow \text{can be arranged first or second} \quad \text{M1A1}$$

$$= 9.49 \times 10^{18}$$

b) 15_{C_2} ← boys   A1 10_{C_3} ← girls

$$\binom{15}{2} \times \binom{10}{3} = 12600 \quad \text{M1A1}$$

6/6

11.

a) $^{10}C_6 = 210$ ✓ M1A1

b) $2C_1 \times {^8C_5} = 112$ ✓ M1A1A1

c) $\dfrac{112}{210}$ ✓ $= 0.533\ldots$ M1

$= \dfrac{8}{15}$ ✓ A1

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