Dreaming big

Visualising the future

Calculating long-term financial goals

Your life as a tree

Your life as a tree … with bias

Your life as a tree … with chance

Wisdom

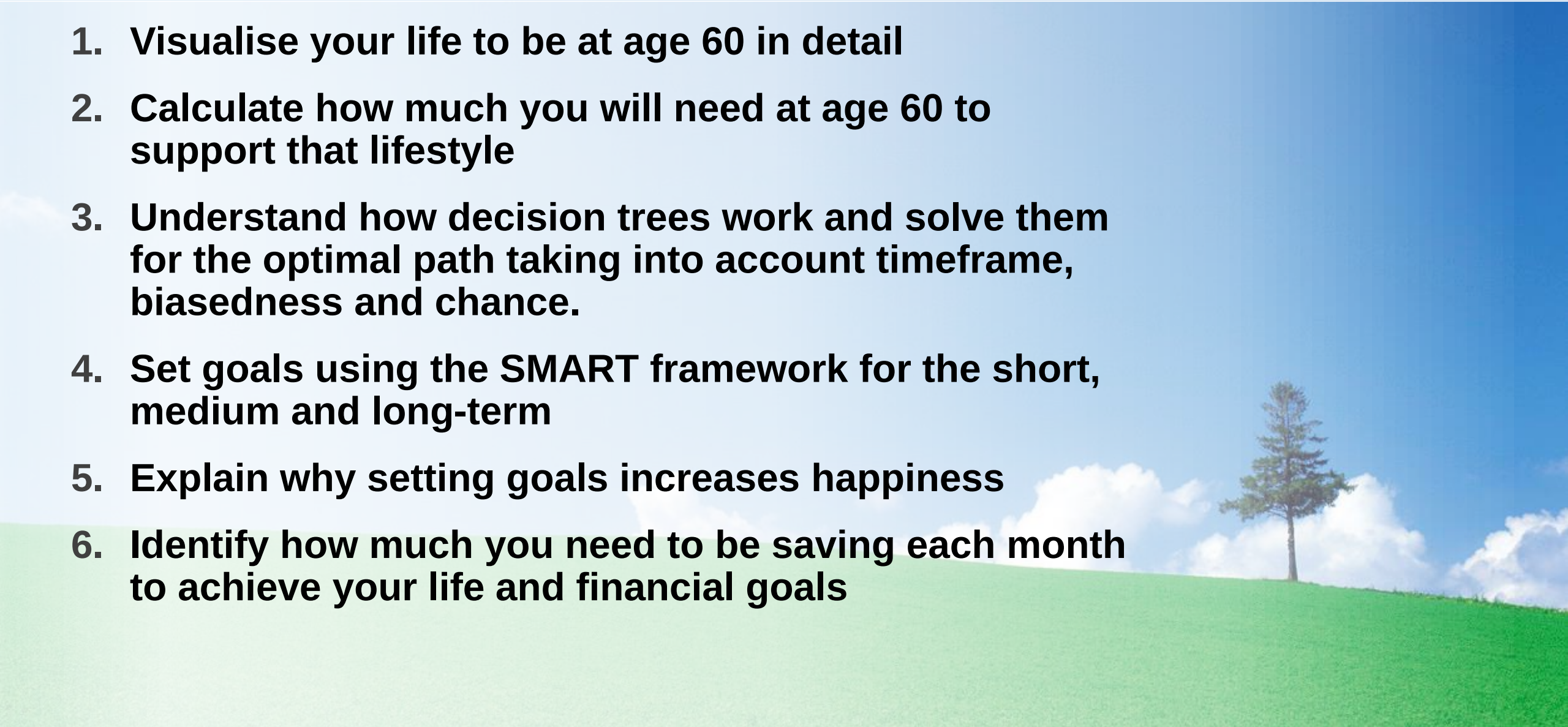
Setting goals

Why setting goals increases happiness

Planning to save

You need to be able to …

1. Visualise your life to be at age 60 in detail
2. Calculate how much you will need at age 60 to support that lifestyle
3. Understand how decision trees work and solve them for the optimal path taking into account timeframe, biasedness and chance.
4. Set goals using the SMART framework for the short, medium and long-term
5. Explain why setting goals increases happiness
6. Identify how much you need to be saving each month to achieve your life and financial goals



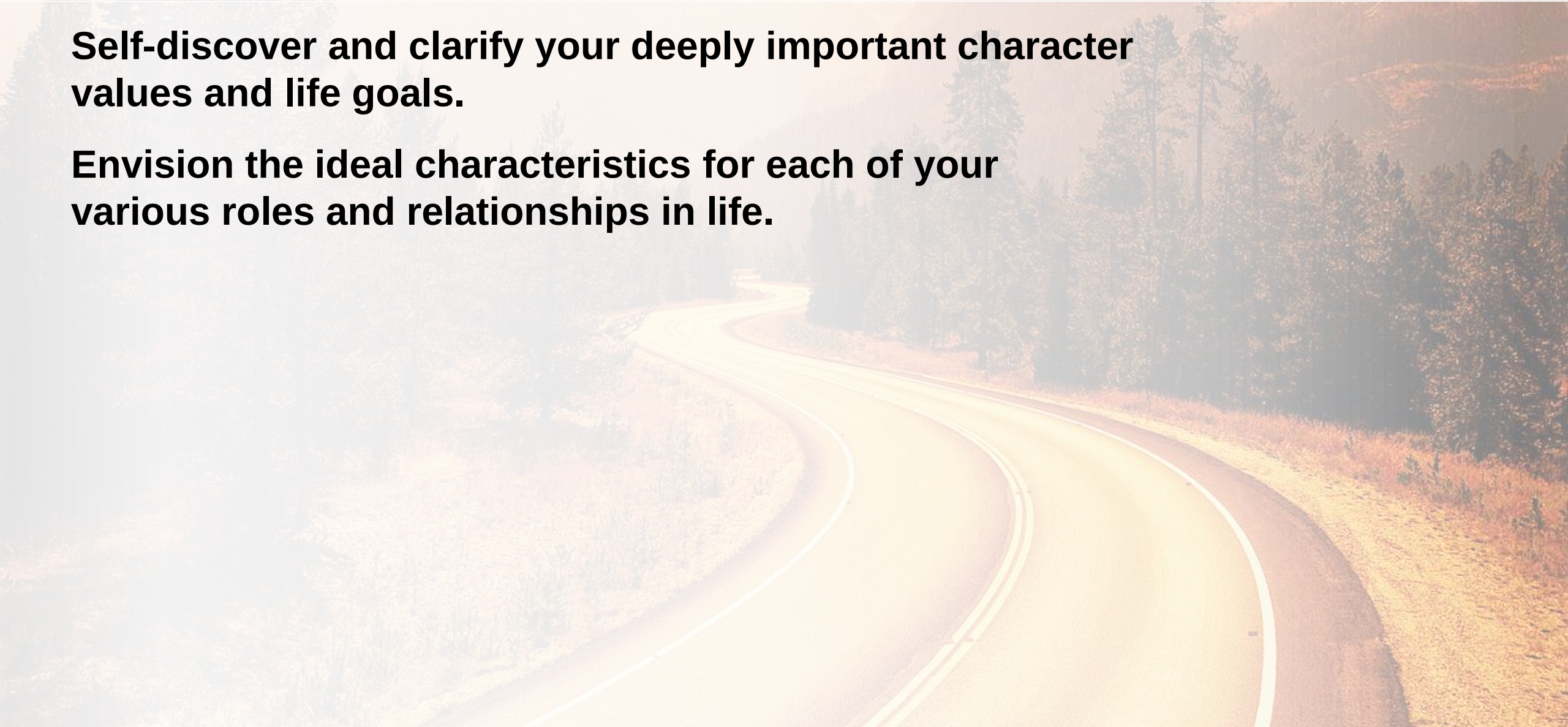
Visualising your future

7 Habits of Highly Effective People

1. **Be Proactive**
2. **Begin with the End in Mind**
3. **Put First Things First**
4. **Think Win-Win**
5. **Seek First to Understand, Then to be Understood**
6. **Synergise**
7. **Sharpen the Saw**

7 Habits of Highly Effective People by Stephen R Covey

Habit 2: Begin with the End in Mind

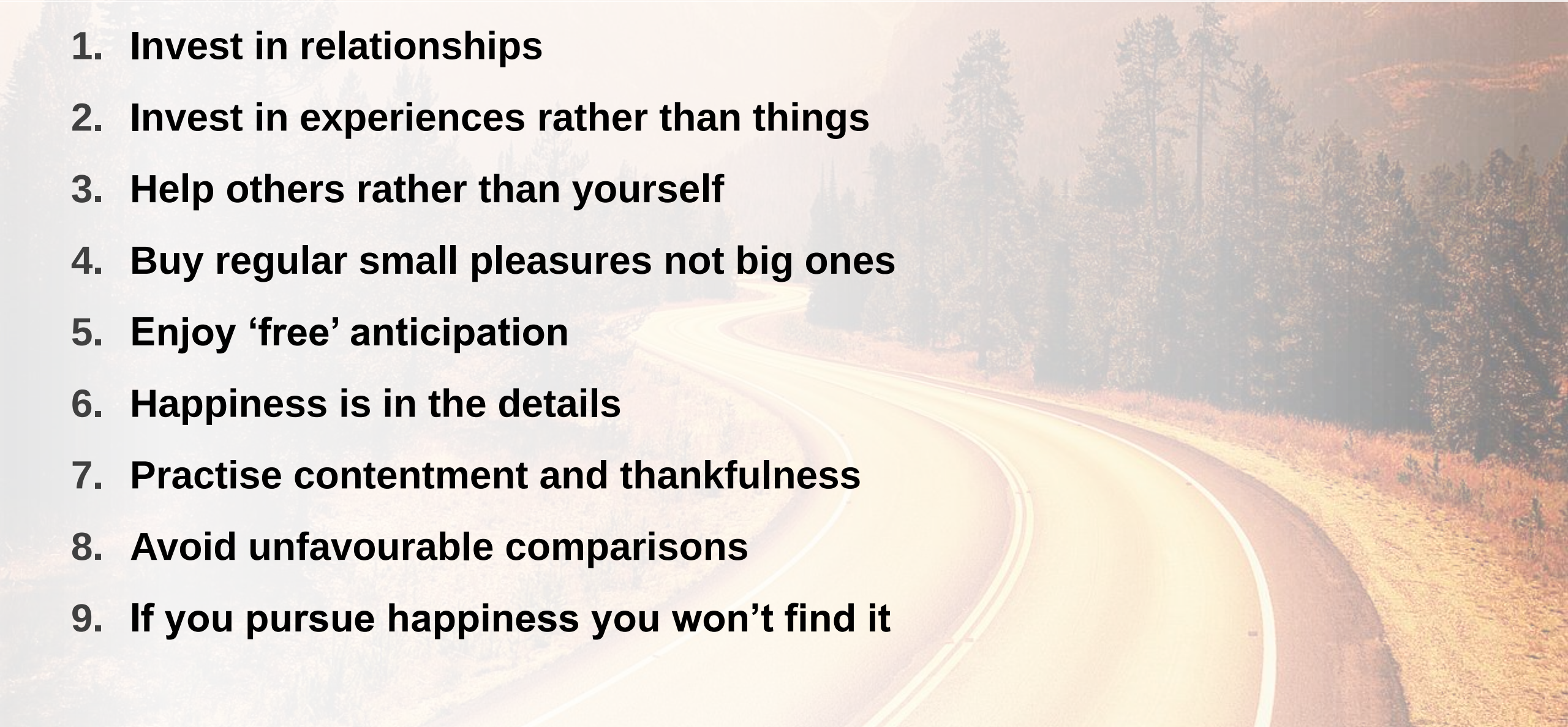


Self-discover and clarify your deeply important character values and life goals.

Envision the ideal characteristics for each of your various roles and relationships in life.

Recap: Principles of Happiness

1. Invest in relationships
2. Invest in experiences rather than things
3. Help others rather than yourself
4. Buy regular small pleasures not big ones
5. Enjoy ‘free’ anticipation
6. Happiness is in the details
7. Practise contentment and thankfulness
8. Avoid unfavourable comparisons
9. If you pursue happiness you won’t find it

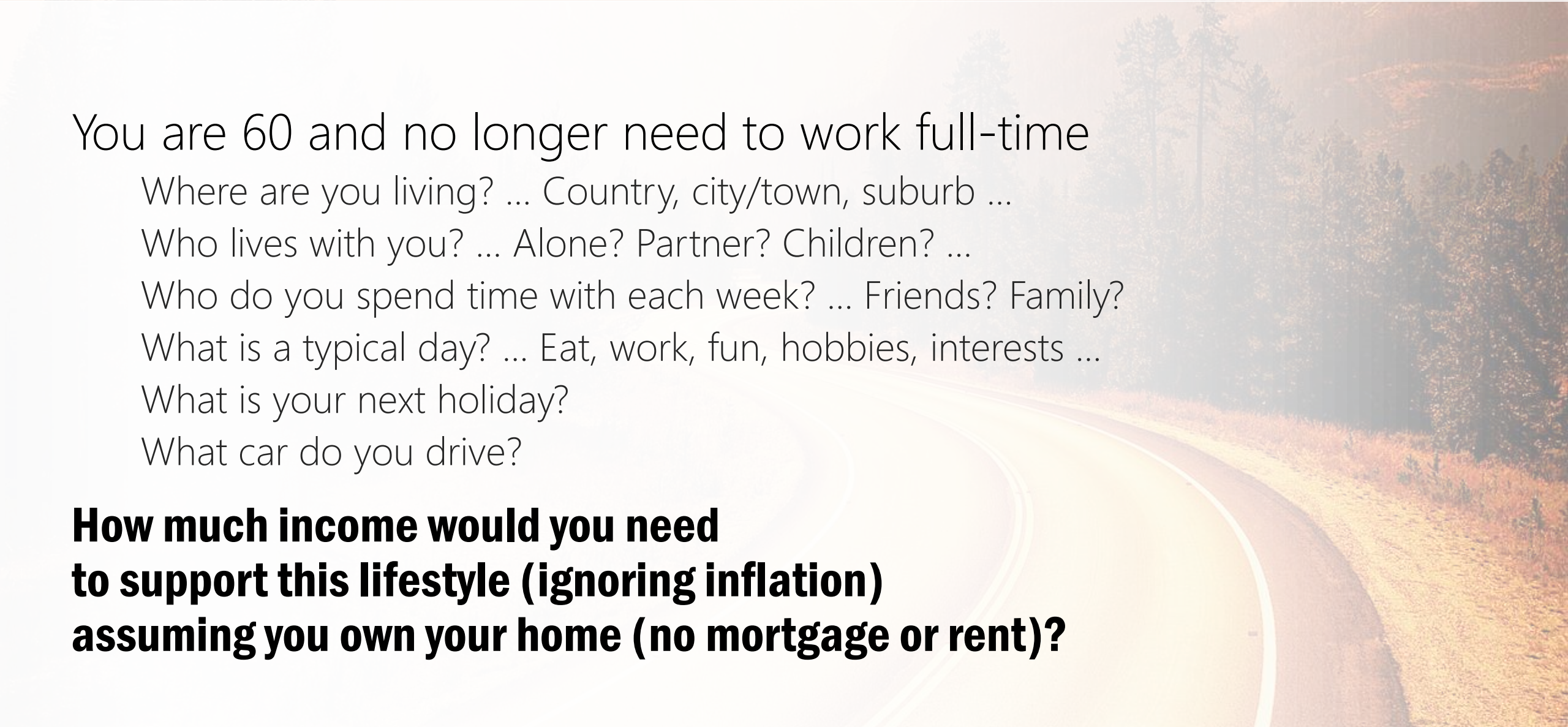


Activity: Visualize your future

You are 60 and no longer need to work full-time

- Where are you living? ... Country, city/town, suburb ...
- Who lives with you? ... Alone? Partner? Children? ...
- Who do you spend time with each week? ... Friends? Family?
- What is a typical day? ... Eat, work, fun, hobbies, interests ...
- What is your next holiday?
- What car do you drive?

Q1: Investment income goal for age 60



You are 60 and no longer need to work full-time

- Where are you living? ... Country, city/town, suburb ...
- Who lives with you? ... Alone? Partner? Children? ...
- Who do you spend time with each week? ... Friends? Family?
- What is a typical day? ... Eat, work, fun, hobbies, interests ...
- What is your next holiday?
- What car do you drive?

How much income would you need
to support this lifestyle (ignoring inflation)
assuming you own your home (no mortgage or rent)?

Calculating long-term financial goals

Inflation

Prices of goods go up each year

This is because demand for goods (linked to income) keeps going up by more than our ability to produce more goods (linked to productivity)

In most developed nations, Central Banks aim to keep inflation between 2% and 3% per year

Investment returns are usually ‘nominal returns’ in that there is no correction for inflation (say 10% per year).

To get the ‘real return’ you just deduct the rate of inflation from the nominal returns (10% - 2.5% = 7.5%)

Growing perpetuity formula ($A_{\infty,g}$)

A is the 'real value' that your financial investments must accumulate to by age 60 (ignoring inflation).

R_1 is the 'real value' of your estimated living expenses at age 60 for one year (ignoring inflation).

'g' is the rate of increase (or decay if it is negative) of our living expenses after age 60 above the rate of inflation.

'r' is the 'real' rate of return that you expect your investments to achieve after the age of 60 over and above inflation.

$$A_{\infty,g} = \frac{R_1}{(r - g)}$$

Example 1

How much would Susan need for financial independence if she would like $80,000 per year (ignoring inflation), growing at the rate of inflation (which she expects to be 2.5% per year) if she can achieve nominal investment returns of 9.0% per year (real returns of 6.5%)?

$$A_{\infty,g} = \frac{R_1}{(r - g)}$$

$$= \frac{80,000}{0.065 - 0}$$

$$= 1,230,769$$

Example 2

How much would David need for financial independence if he would like $80,000 per year (ignoring inflation), growing at the rate of 2% above inflation (which he expects to be 2.5% per year) if he can achieve nominal investment returns of 9.0% per year (6.5% per year)?

$$A_{\infty,g} = \frac{R_1}{(r - g)}$$

$$= \frac{80,000}{0.065 - 0.02}$$

$$= 1,777,778$$

Q2: Calculate age 60 financial goals

a) **John would like $100,000 per year in income when he is financially independent at age 60 and for that amount to keep pace with inflation. He expects inflation to be 2.5% per year and his investments to achieve nominal returns of 9.0% per year and real returns of 6.5% per year. How much does he need for financial independence?**

b) **Sarah would like to receive the same amount as John above but is happy for the 'real value' of her income to decline by 2% per year (that is, increase at a rate of 2% below inflation). How much does she need for financial independence?**

c) **Based on your planned future lifestyle, how much do you need for financial independence assuming 2.5% inflation and 6.5% real returns on your investments?**

Go to Answer

Your life as a tree

Andrew Hingston

Think and discuss

What are the top 5 decisions
over the next 10 years
that will have the

biggest impact

on your long-term happiness?

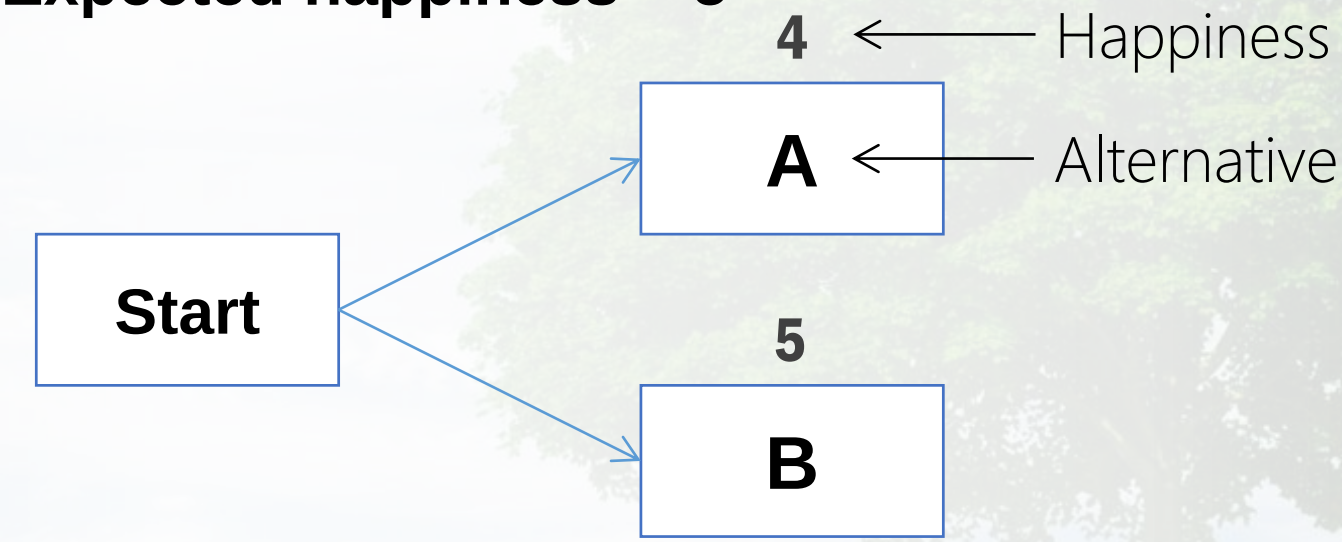
A simple decision tree

You have 2 alternatives: A and B and must choose one

The number above each one is the expected happiness out of 10

Choose B since 5 > 4

Expected happiness = 5

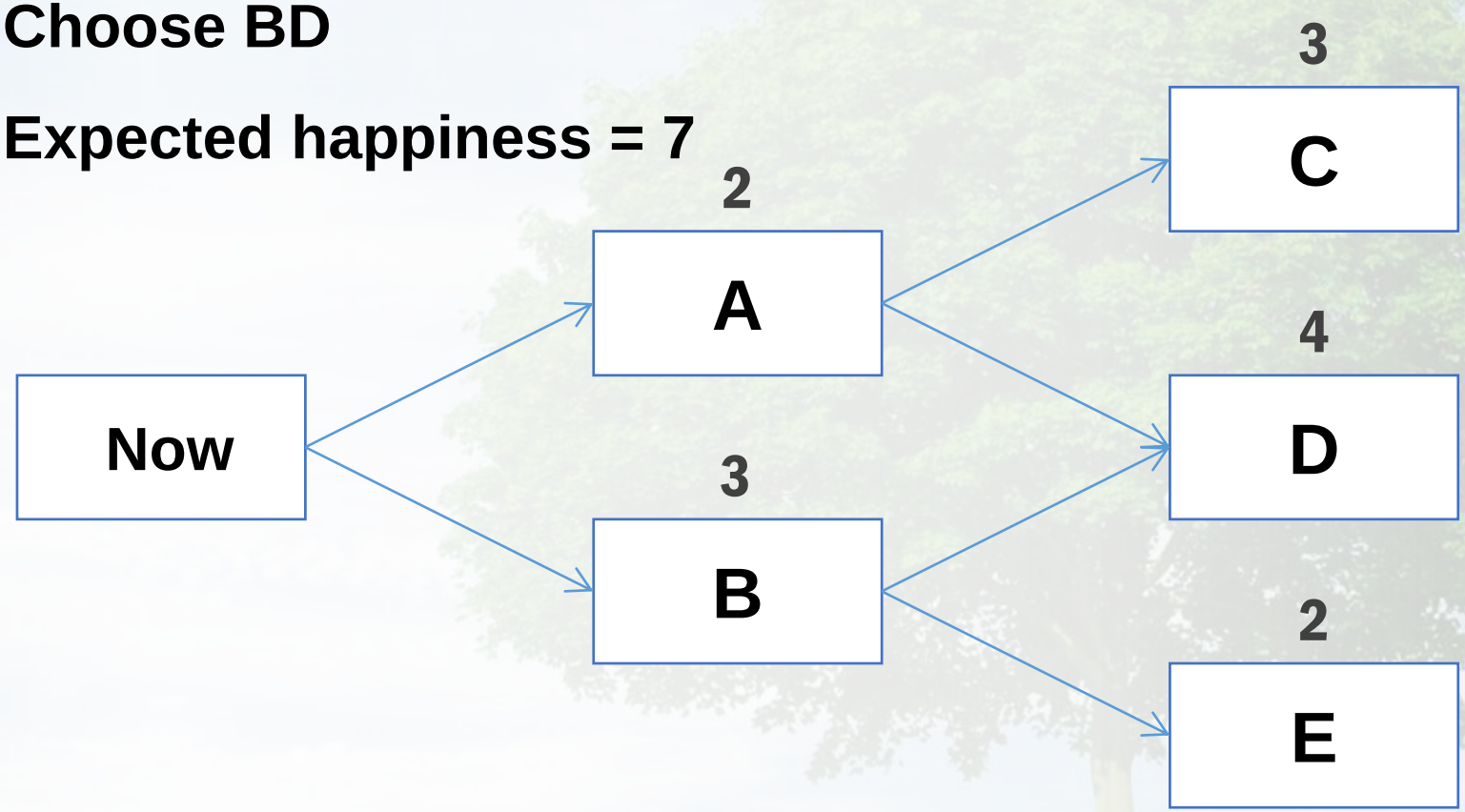


Which path gives the most happiness?

Just count up the numbers along each branch!

Choose BD

Expected happiness = 7

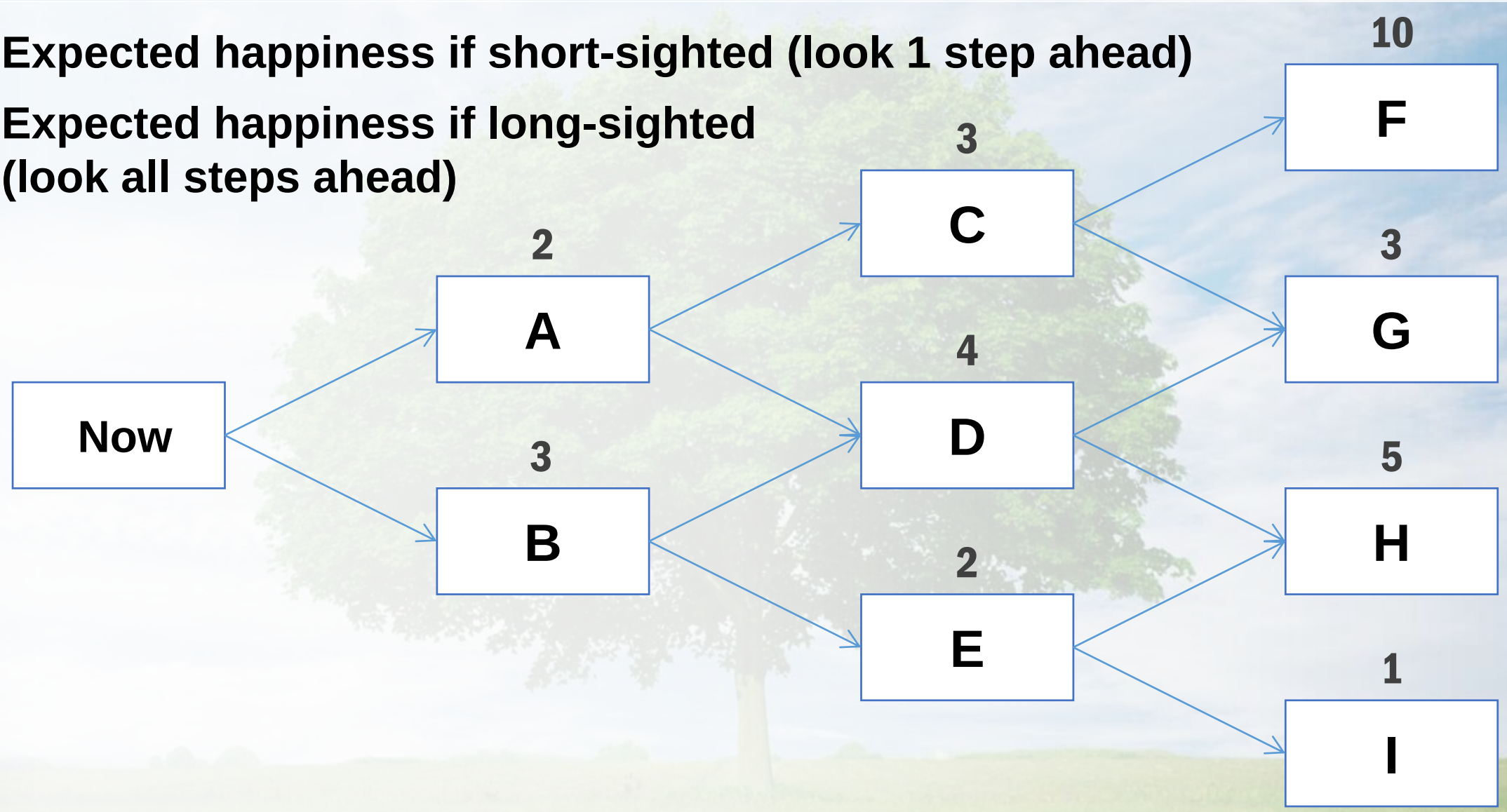


Path	Outcome
AC	2 + 3 = 5
AD	2 + 4 = 6
BD	**3 + 4 = 7**
BE	3 + 2 = 5

Think and discuss

a) **Expected happiness if short-sighted (look 1 step ahead)**

b) **Expected happiness if long-sighted (look all steps ahead)**

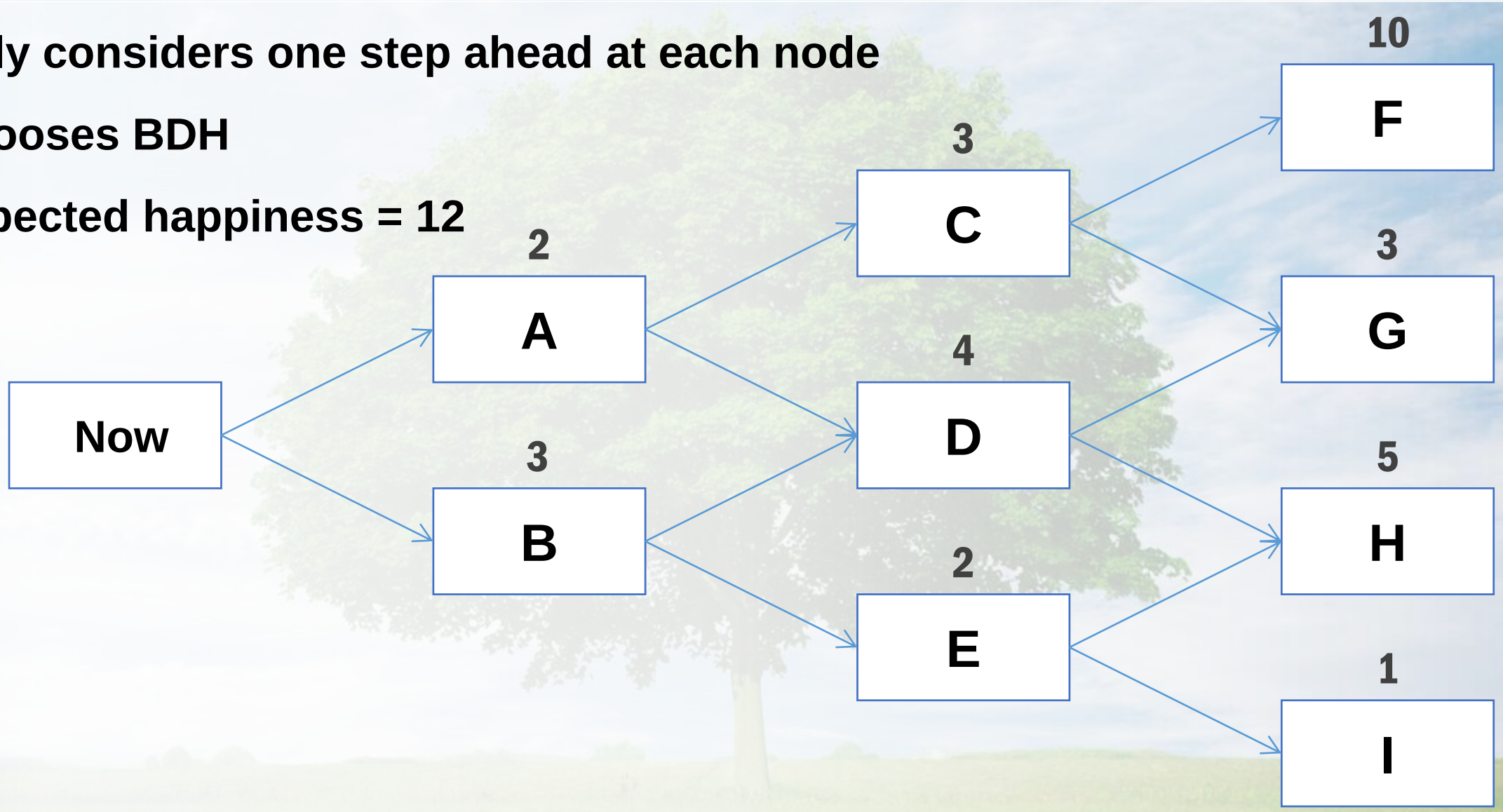


Short-sighted approach

Only considers one step ahead at each node

Chooses BDH

Expected happiness = 12

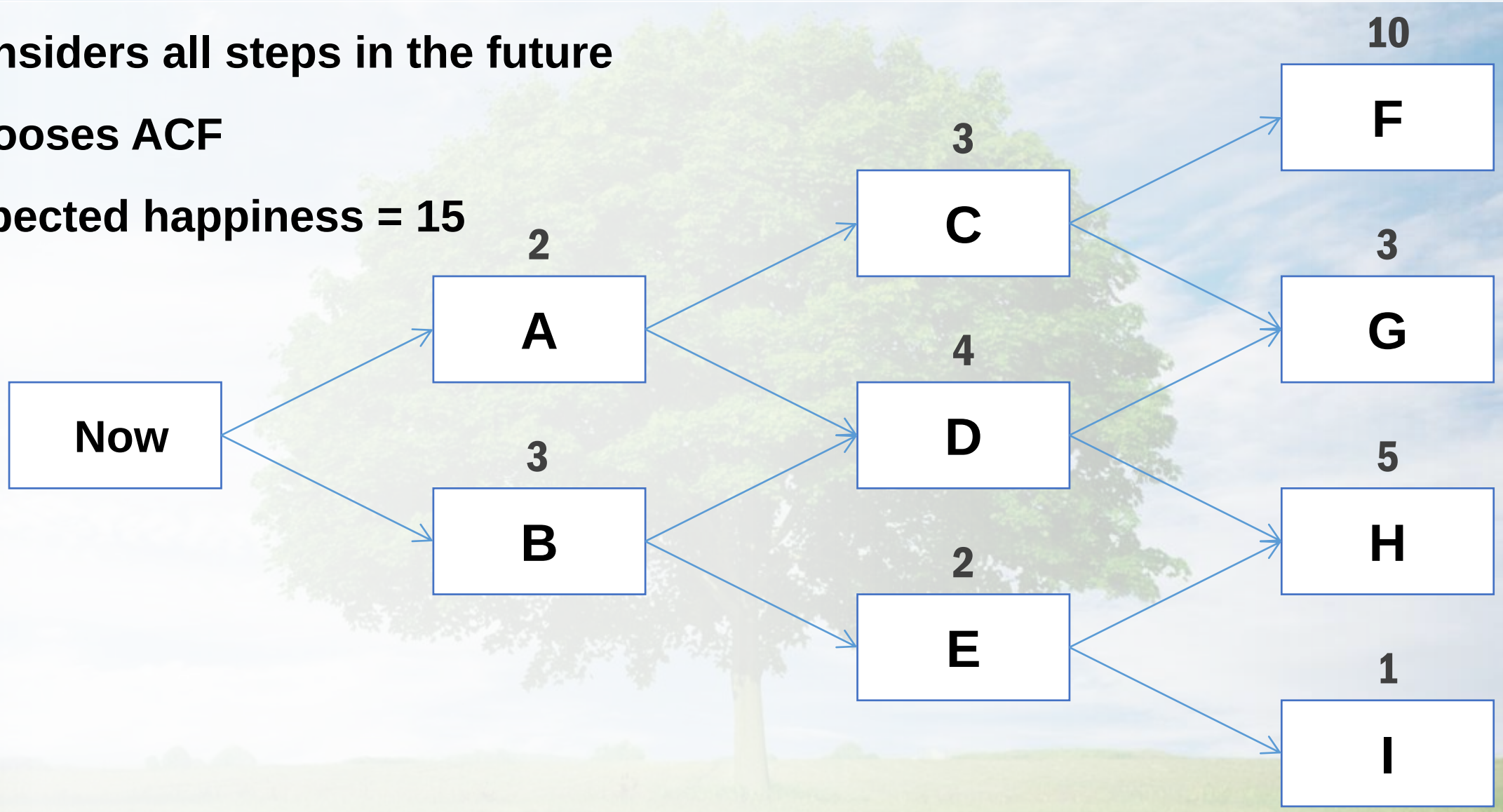


Long-sighted approach

Considers all steps in the future

Chooses ACF

Expected happiness = 15



Long-sighted proof

Proof that ACF is best using all possible paths

Path	Happiness
ACF	**2 + 3 + 10 = 15**
ACG	2 + 3 + 3 = 8
ADG	2 + 4 + 3 = 9
ADH	2 + 4 + 5 = 11
BDG	3 + 4 + 3 = 10
BDH	3 + 4 + 5 = 12
BEH	3 + 2 + 5 = 10
BEI	3 + 2 + 1 = 6

Andrew Hingston

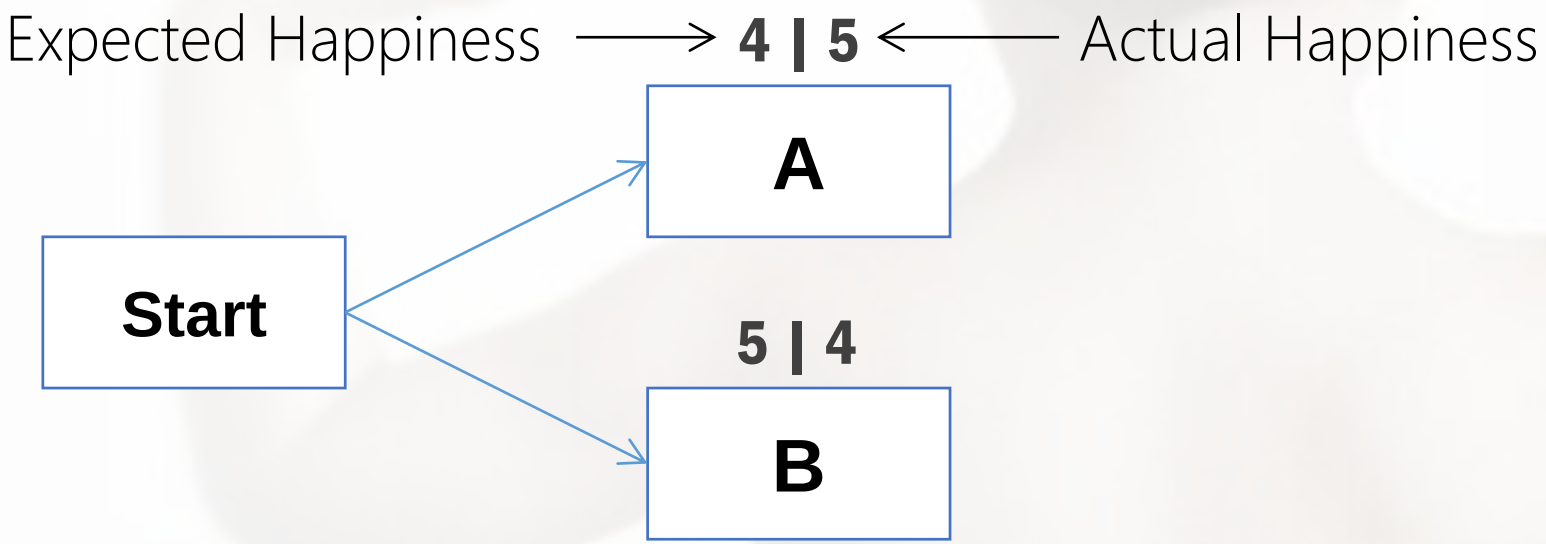
Your life as a tree … with bias

Bias in expected happiness

We are often biased with our expectations of happiness

Expected happiness ≠ actual happiness

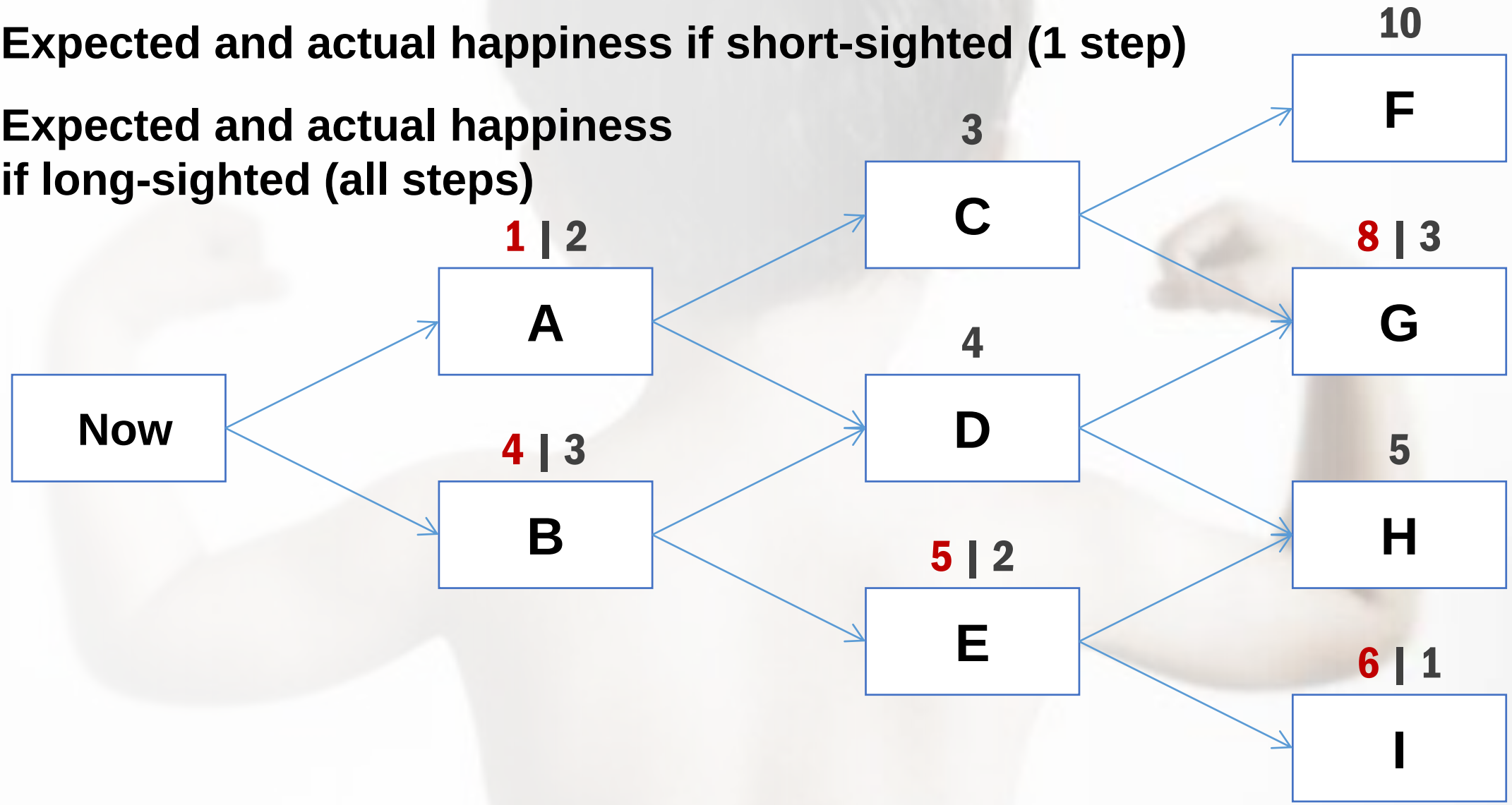
First number is expected and second is actual



Think and discuss

a) **Expected and actual happiness if short-sighted (1 step)**

b) **Expected and actual happiness if long-sighted (all steps)**

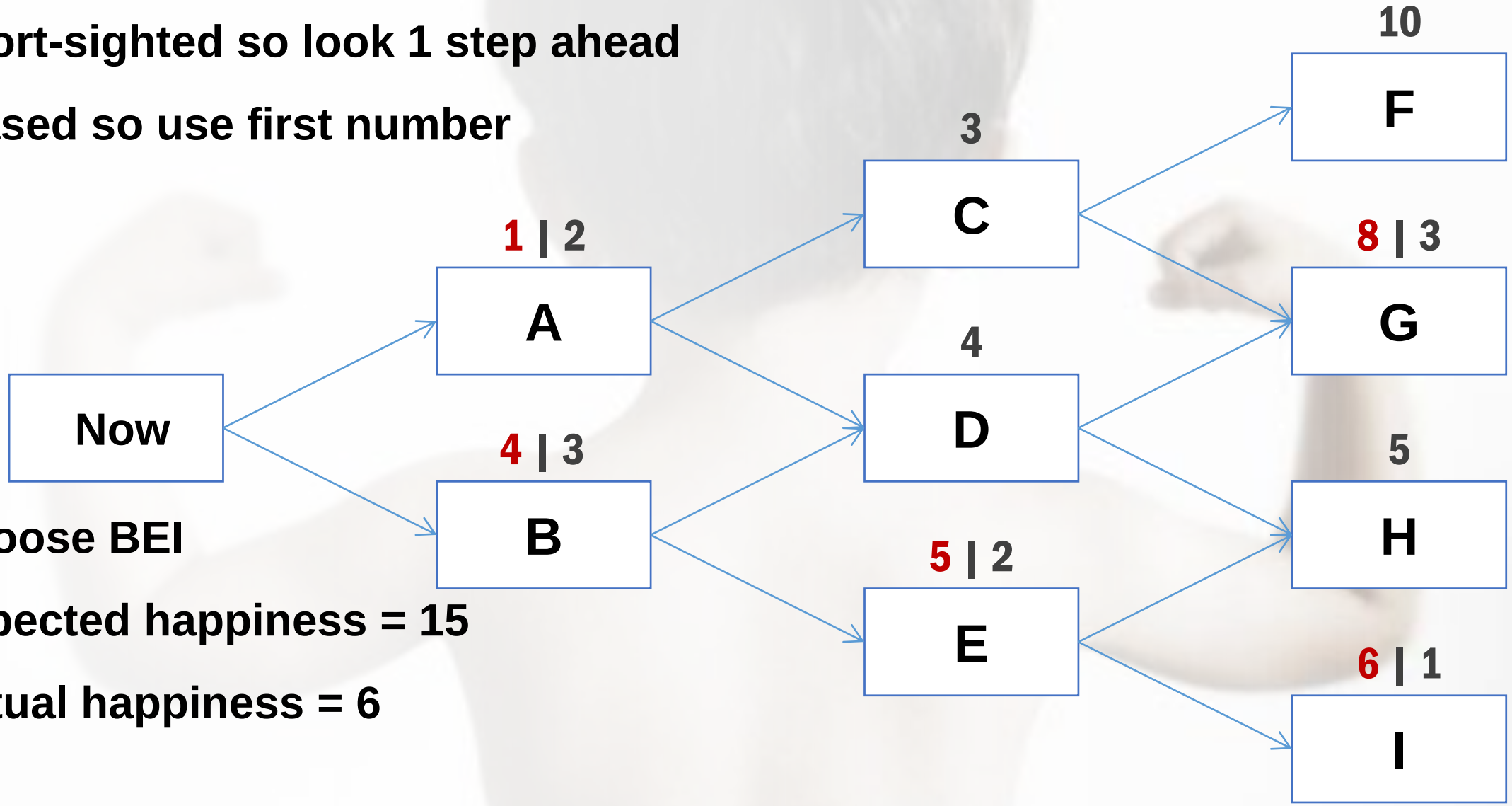


Andrew Hingston

Short-sighted biased approach

Short-sighted so look 1 step ahead

Biased so use first number



Choose BEI

Expected happiness = 15

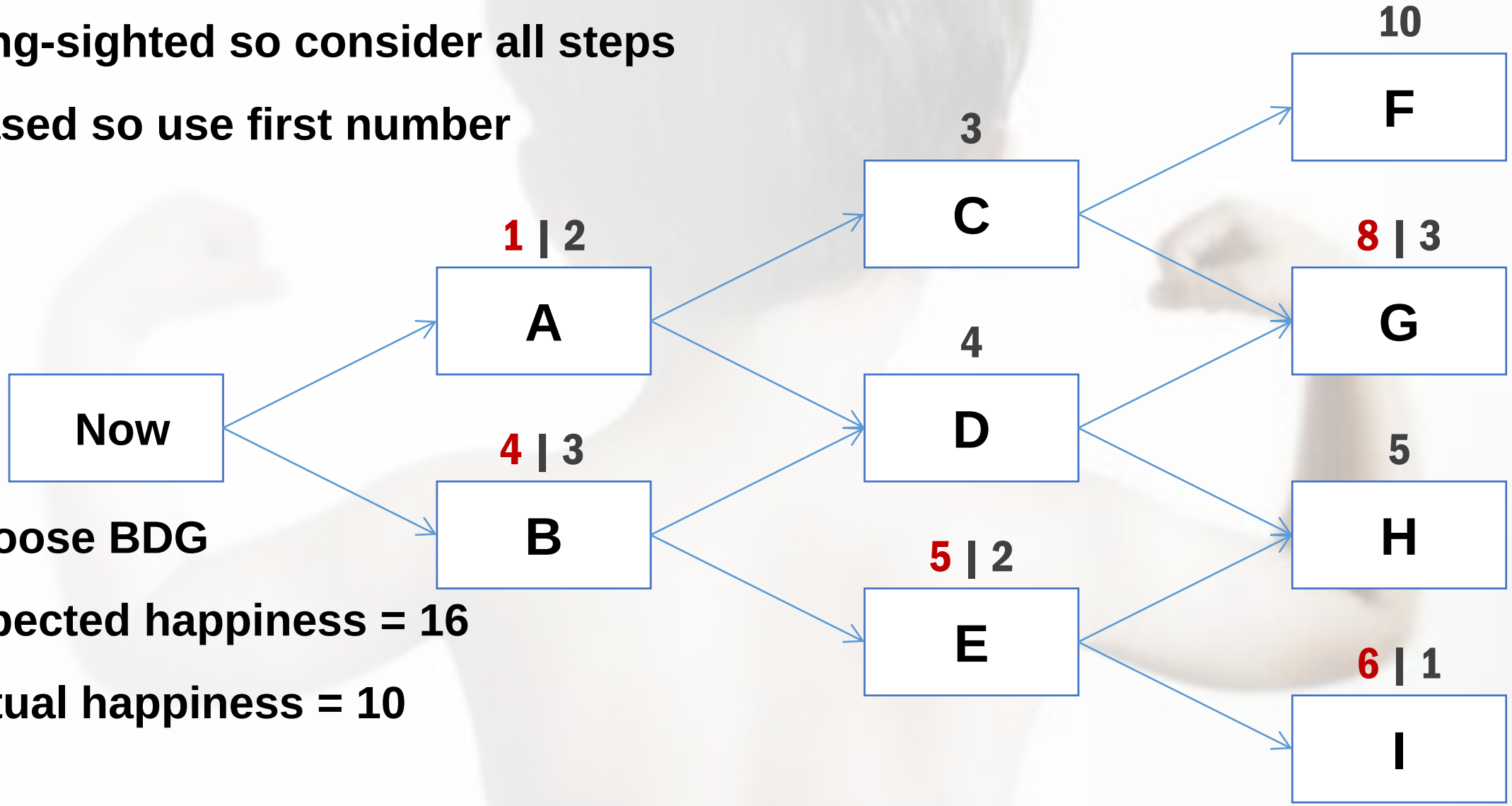
Actual happiness = 6

Andrew Hingston

Long-sighted biased approach

Long-sighted so consider all steps

Biased so use first number



Choose BDG

Expected happiness = 16

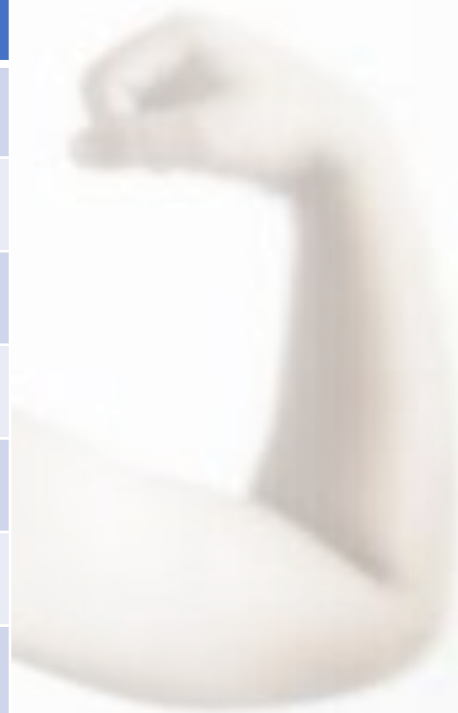
Actual happiness = 10

Long-sighted biased proof

Proof that BDG has highest expected value

Biased and so decisions made on expected not actual

Strategy	Expected	Actual
ACF	1 + 3 + 10 = 14	2 + 3 + 10 = 15
ACG	1 + 3 + 8 = 12	2 + 3 + 3 = 8
ADG	1 + 4 + 8 = 13	2 + 4 + 3 = 9
ADH	1 + 4 + 5 = 10	2 + 4 + 5 = 11
BDG	**4 + 4 + 8 = 16**	**3 + 4 + 3 = 10**
BDH	4 + 4 + 5 = 13	3 + 4 + 5 = 12
BEH	4 + 5 + 5 = 14	3 + 2 + 5 = 10
BEI	4 + 5 + 6 = 15	3 + 2 + 1 = 6



Being long-sighted and unbiased is awesome!

Person	Path	Actual happiness
Short-sighted unbiased	BDH	12
Long-sighted unbiased	ACF	15
Short-sighted biased	BEI	6
Long-sighted biased	BDG	10

Your life as a tree … with chance

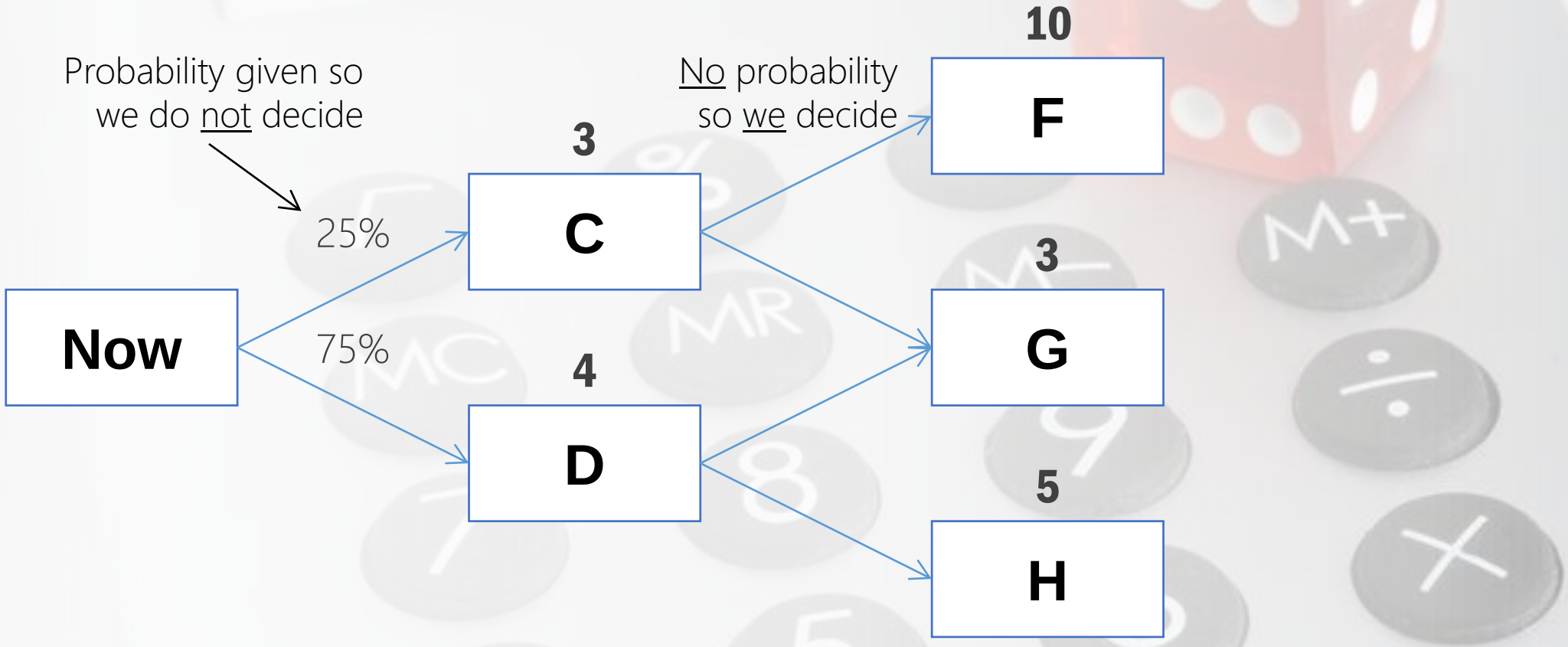
… but it doesn't always work out due to 'chance'

We cannot control all outcomes so probability has a role

If C happens then we would choose CF (13)

If D happens then we would choose DH (9)

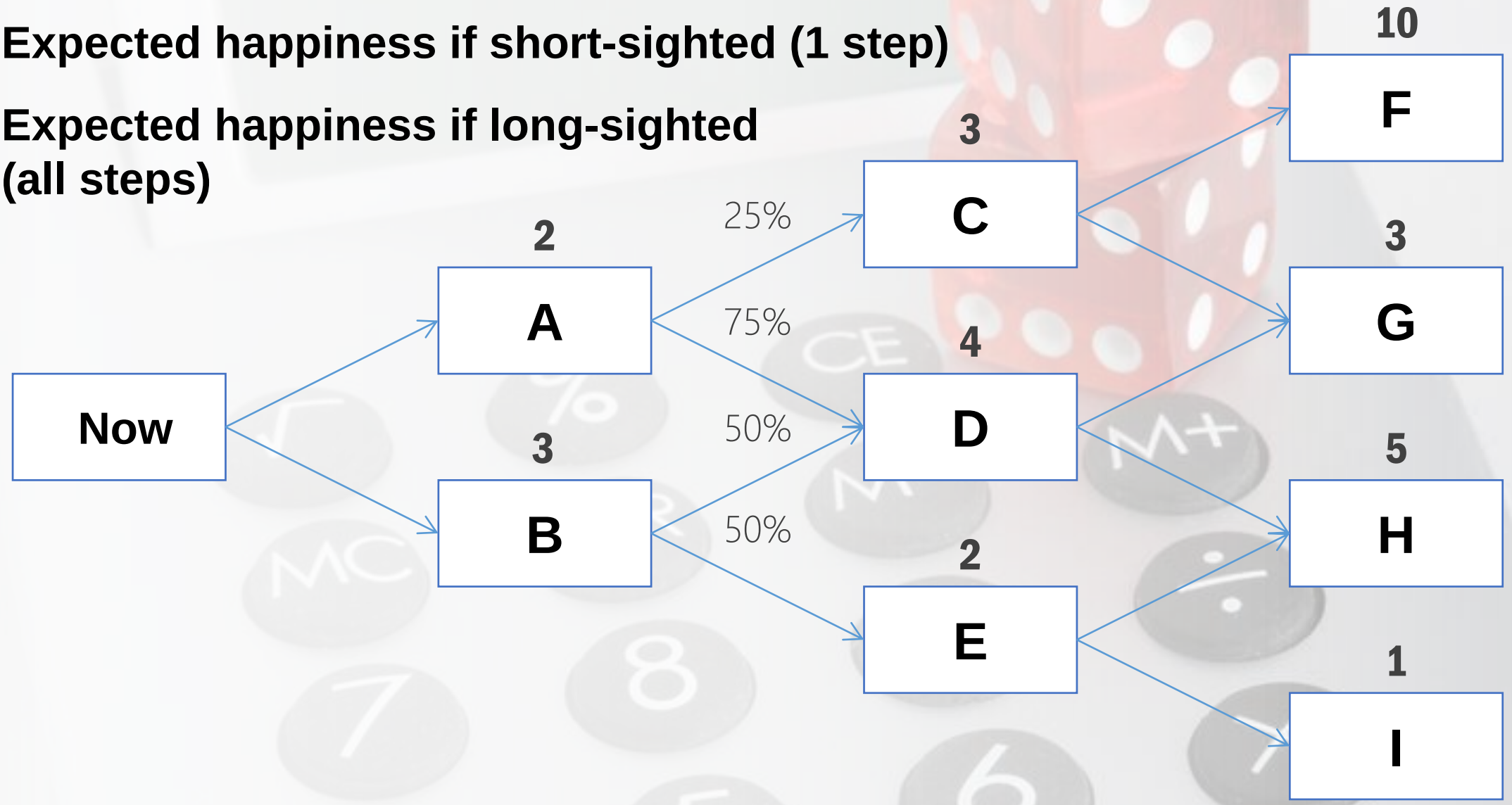
Expected happiness = 0.25 x 13 + 0.75 x 9 = 10



Think and discuss

a) **Expected happiness if short-sighted (1 step)**

b) **Expected happiness if long-sighted (all steps)**



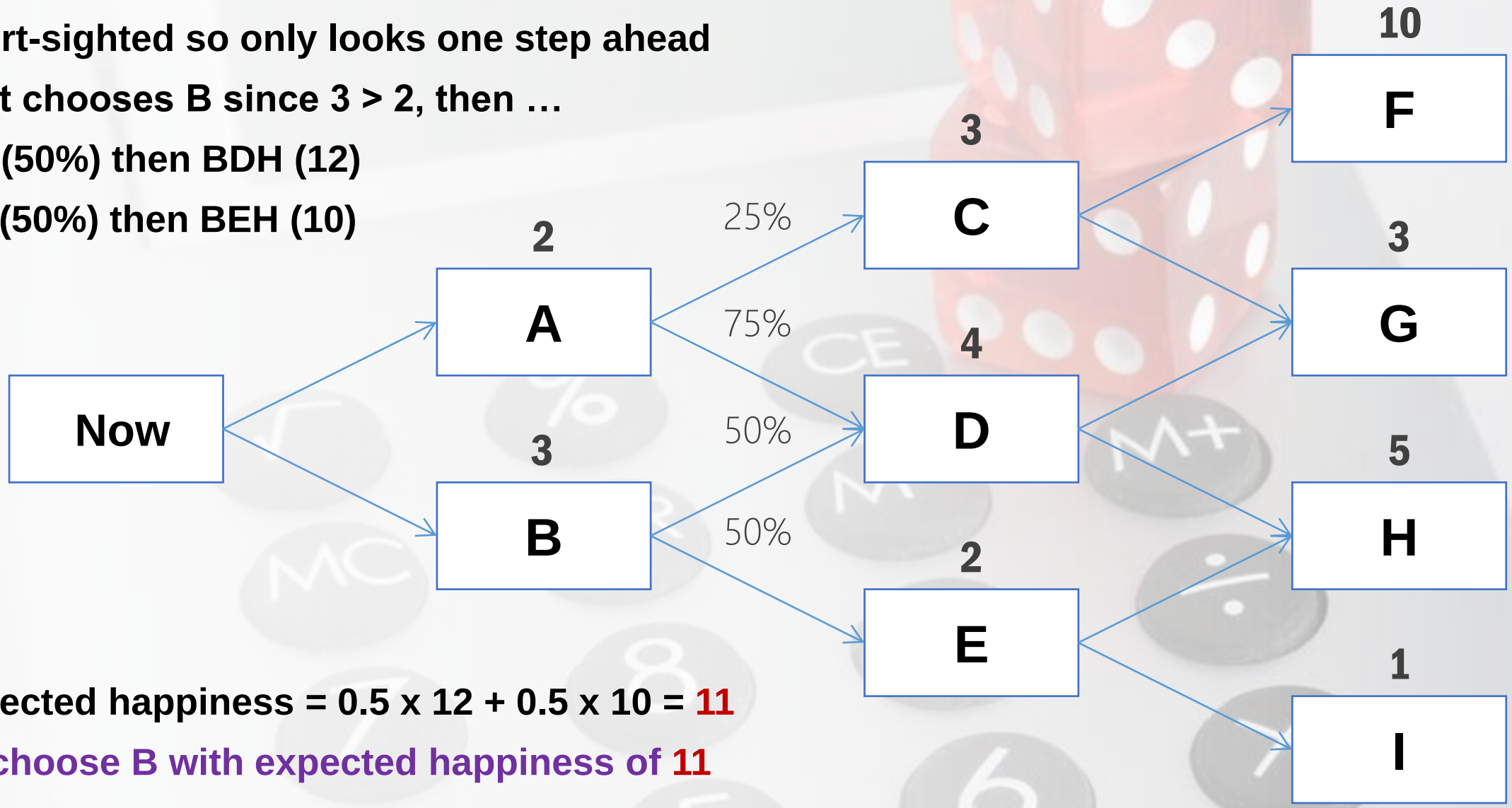
Short-sighted with chance (no bias)

Short-sighted so only looks one step ahead

First chooses B since 3 > 2, then …

If D (50%) then BDH (12)

If E (50%) then BEH (10)



Expected happiness = 0.5 x 12 + 0.5 x 10 = 11

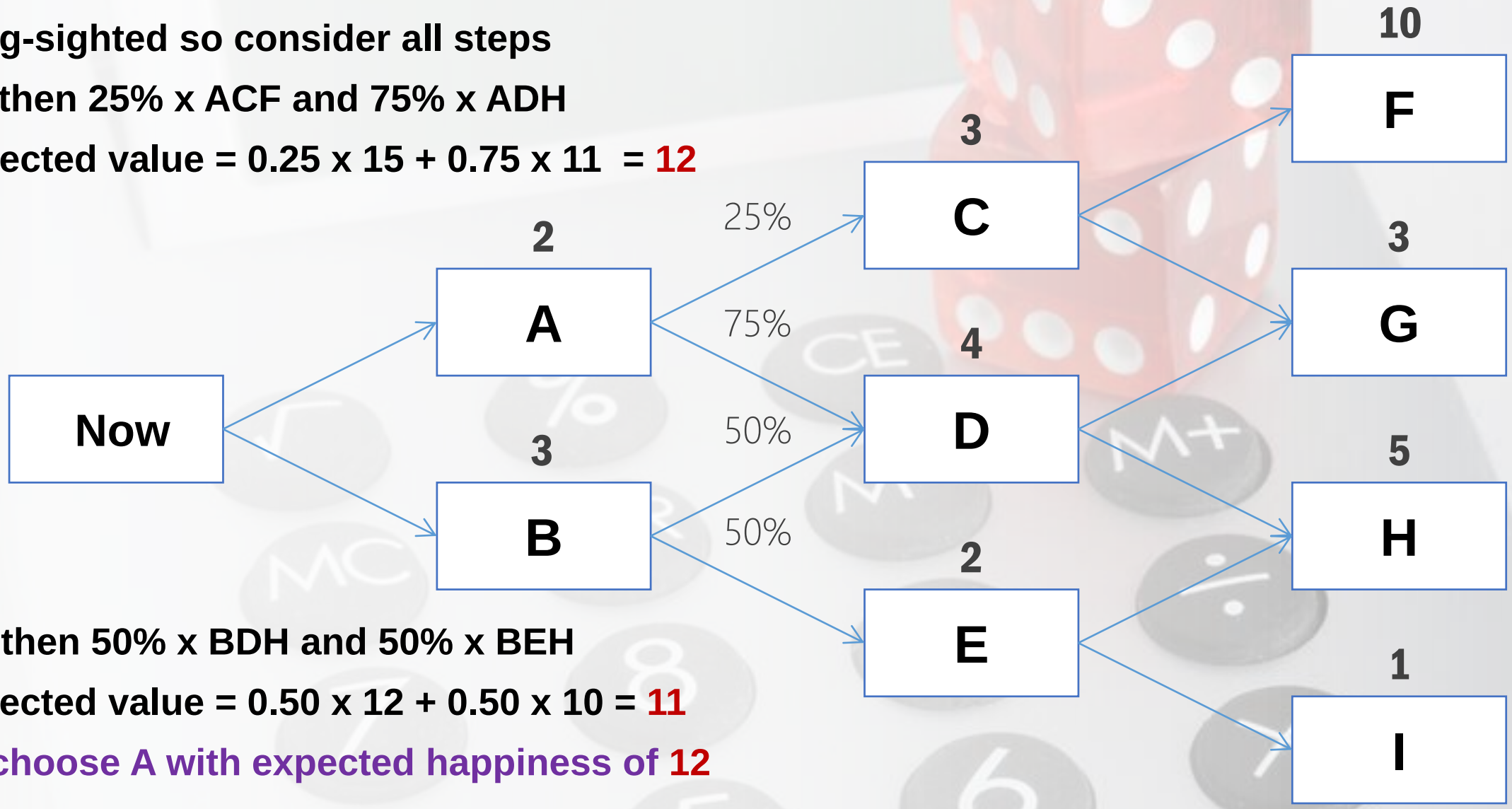
So choose B with expected happiness of 11

Long-sighted with chance (no bias)

Long-sighted so consider all steps

If A then 25% x ACF and 75% x ADH

Expected value = 0.25 x 15 + 0.75 x 11 = 12

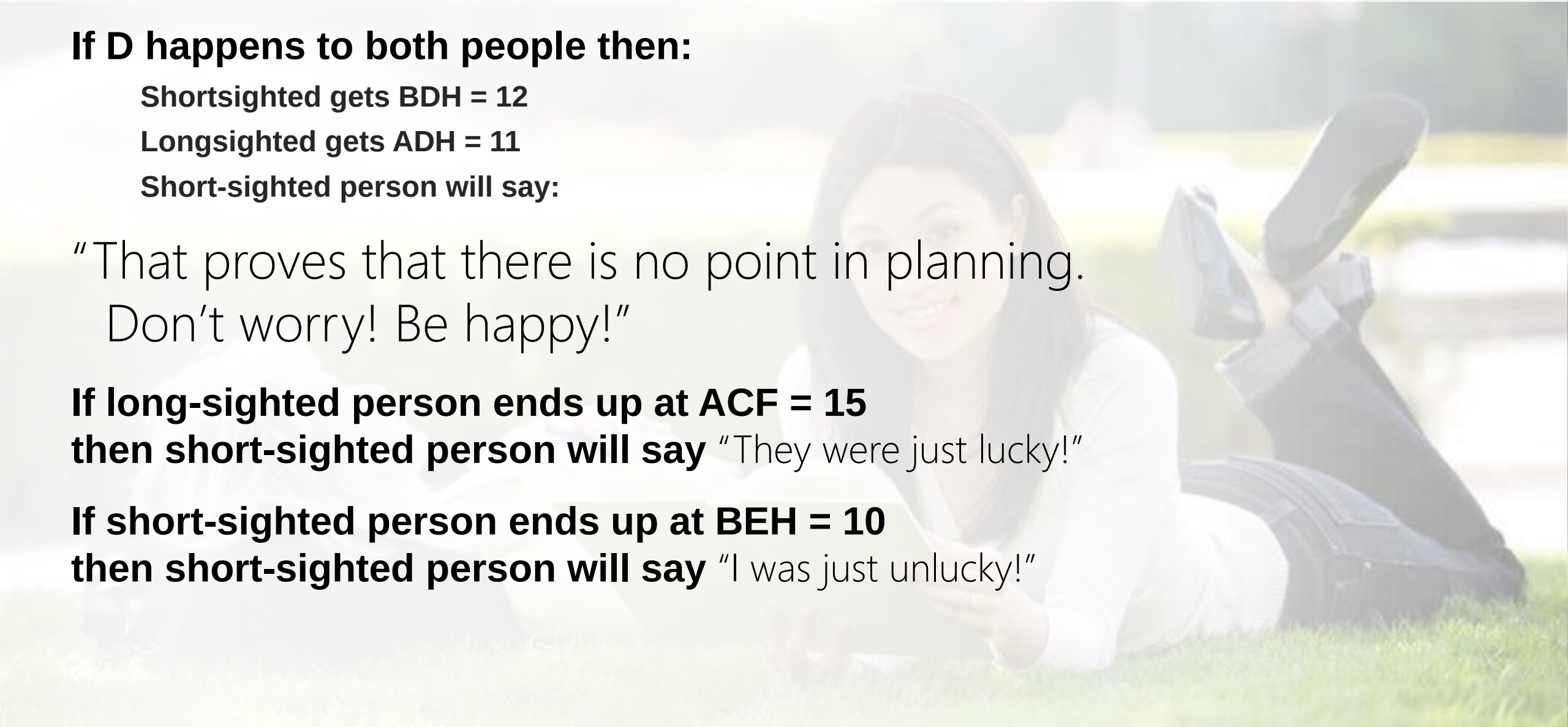


If B then 50% x BDH and 50% x BEH

Expected value = 0.50 x 12 + 0.50 x 10 = 11

So choose A with expected happiness of 12

Note that short-sighted could be better off!



If D happens to both people then:

Shortsighted gets BDH = 12

Longsighted gets ADH = 11

Short-sighted person will say:

"That proves that there is no point in planning.
Don't worry! Be happy!"

If long-sighted person ends up at ACF = 15
then short-sighted person will say "They were just lucky!"

If short-sighted person ends up at BEH = 10
then short-sighted person will say "I was just unlucky!"

Andrew Hingston

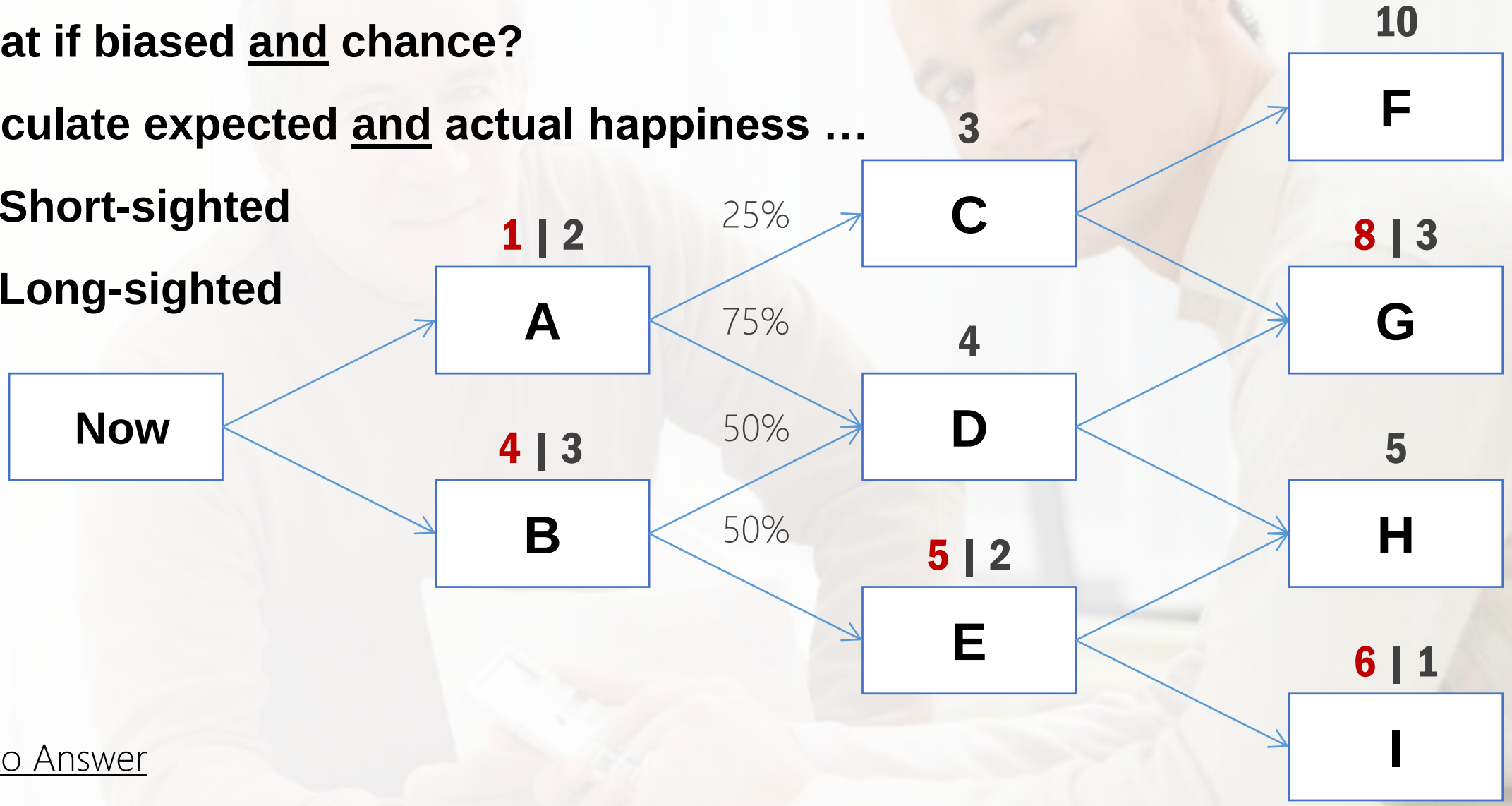
Q3: Life as a tree … with bias and chance (tough)

What if biased and chance?

Calculate expected and actual happiness …

a) **Short-sighted**

b) **Long-sighted**



Go to Answer

Wisdom

Dictionary definition of ‘wisdom’

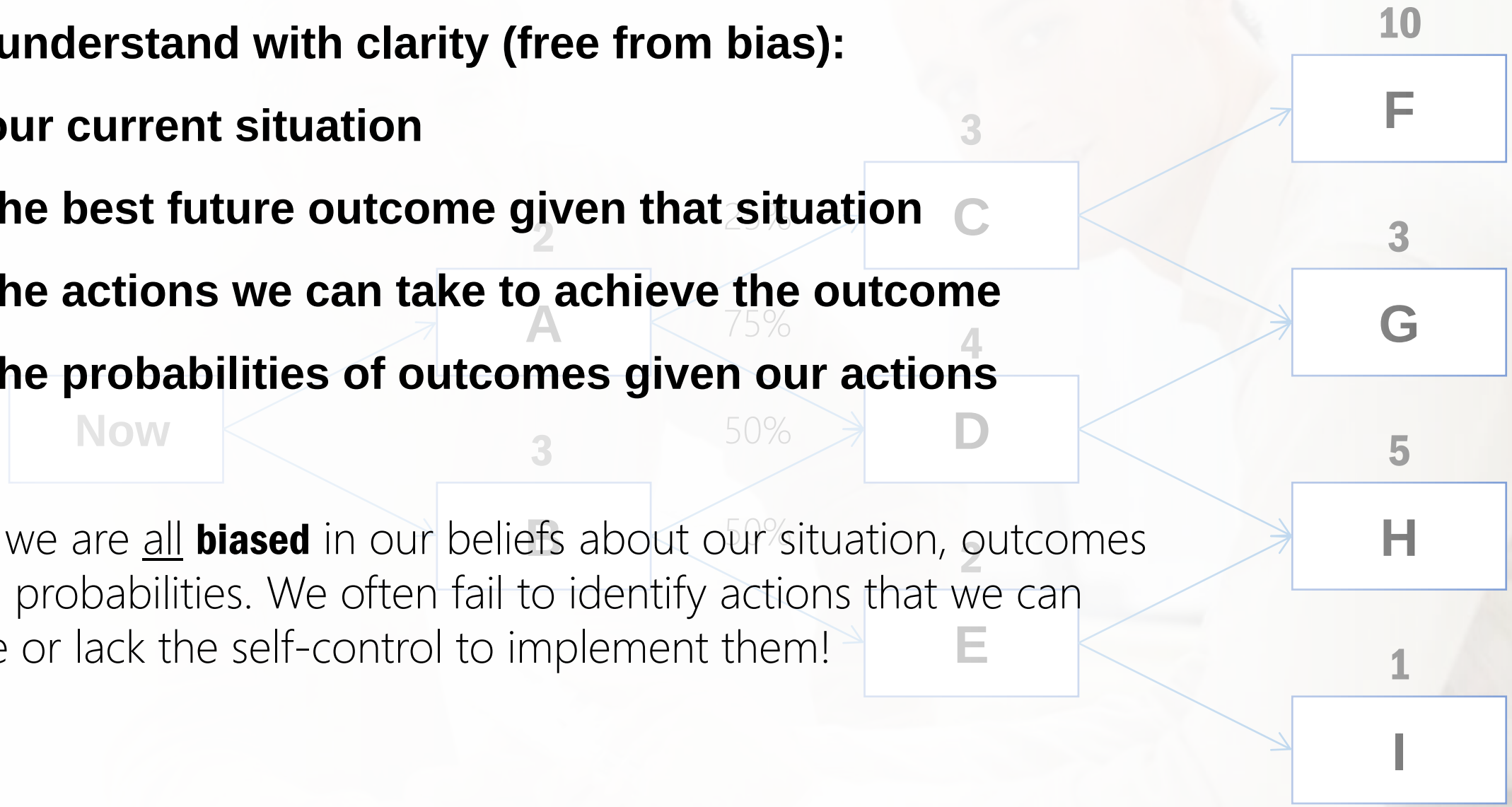
The quality of having
experience
knowledge, and
good judgement

Source: www.oxforddictionaries.com

Andrew's definition of 'wisdom'

To understand with clarity (free from bias):

- **our current situation**
- **the best future outcome given that situation**
- **the actions we can take to achieve the outcome**
- **the probabilities of outcomes given our actions**

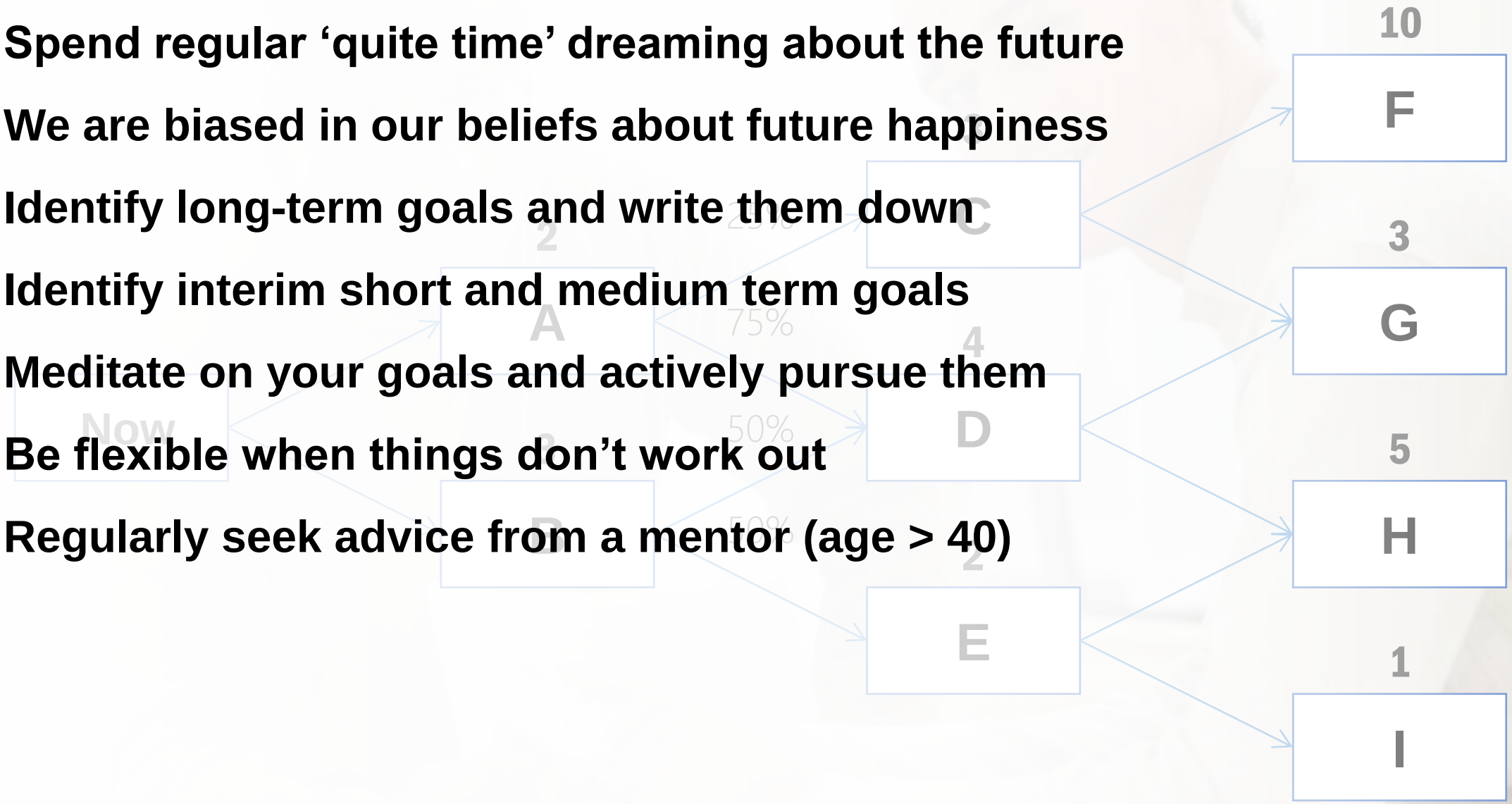


But we are <u>all</u> **biased** in our beliefs about our situation, outcomes and probabilities. We often fail to identify actions that we can take or lack the self-control to implement them!

Andrew Hingston

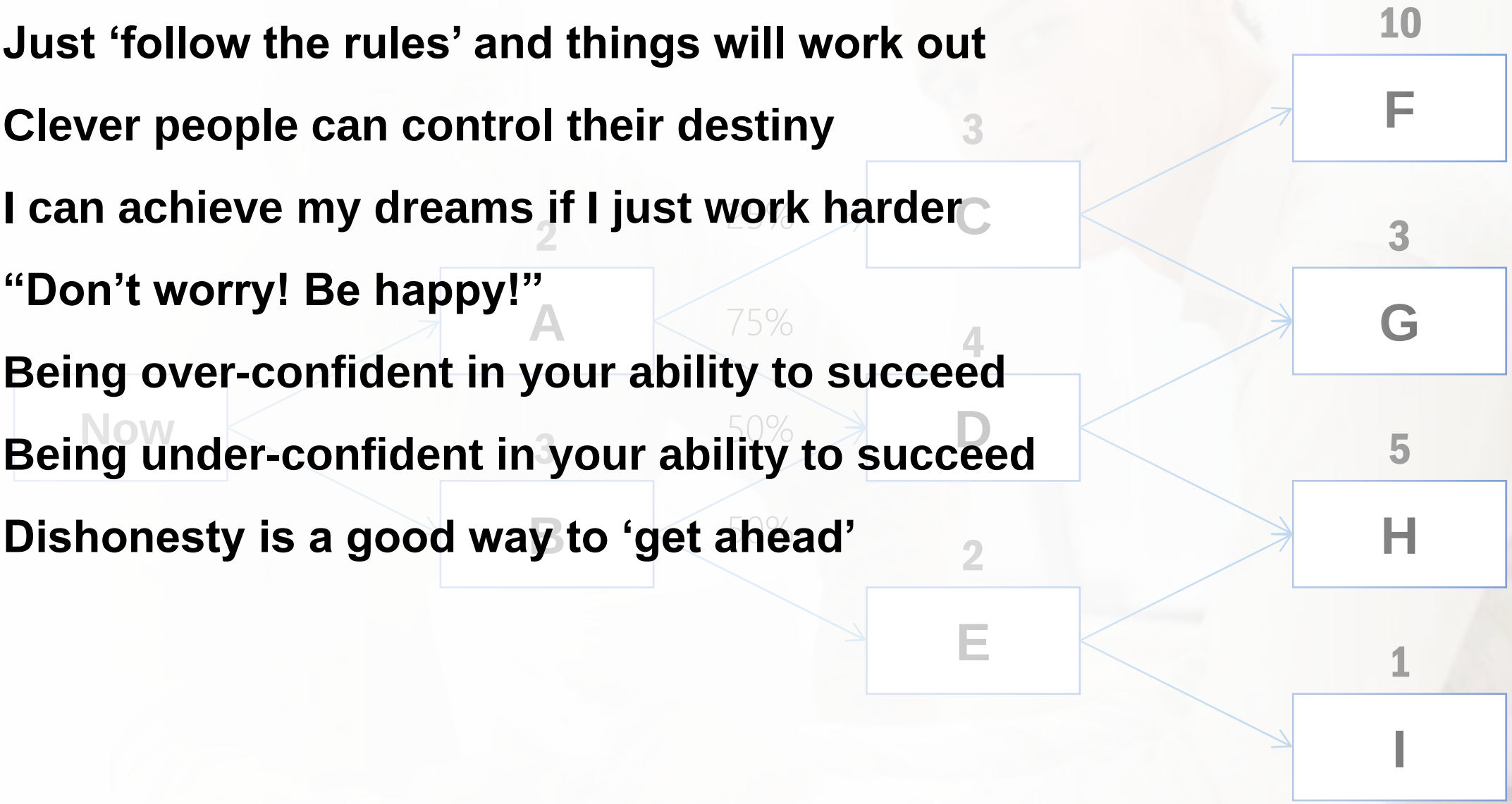
7 ideas that are helpful

1. Spend regular ‘quite time’ dreaming about the future
2. We are biased in our beliefs about future happiness
3. Identify long-term goals and write them down
4. Identify interim short and medium term goals
5. Meditate on your goals and actively pursue them
6. Be flexible when things don’t work out
7. Regularly seek advice from a mentor (age > 40)



7 ideas that are unhelpful

1. Just ‘follow the rules’ and things will work out
2. Clever people can control their destiny
3. I can achieve my dreams if I just work harder
4. “Don’t worry! Be happy!”
5. Being over-confident in your ability to succeed
6. Being under-confident in your ability to succeed
7. Dishonesty is a good way to ‘get ahead’



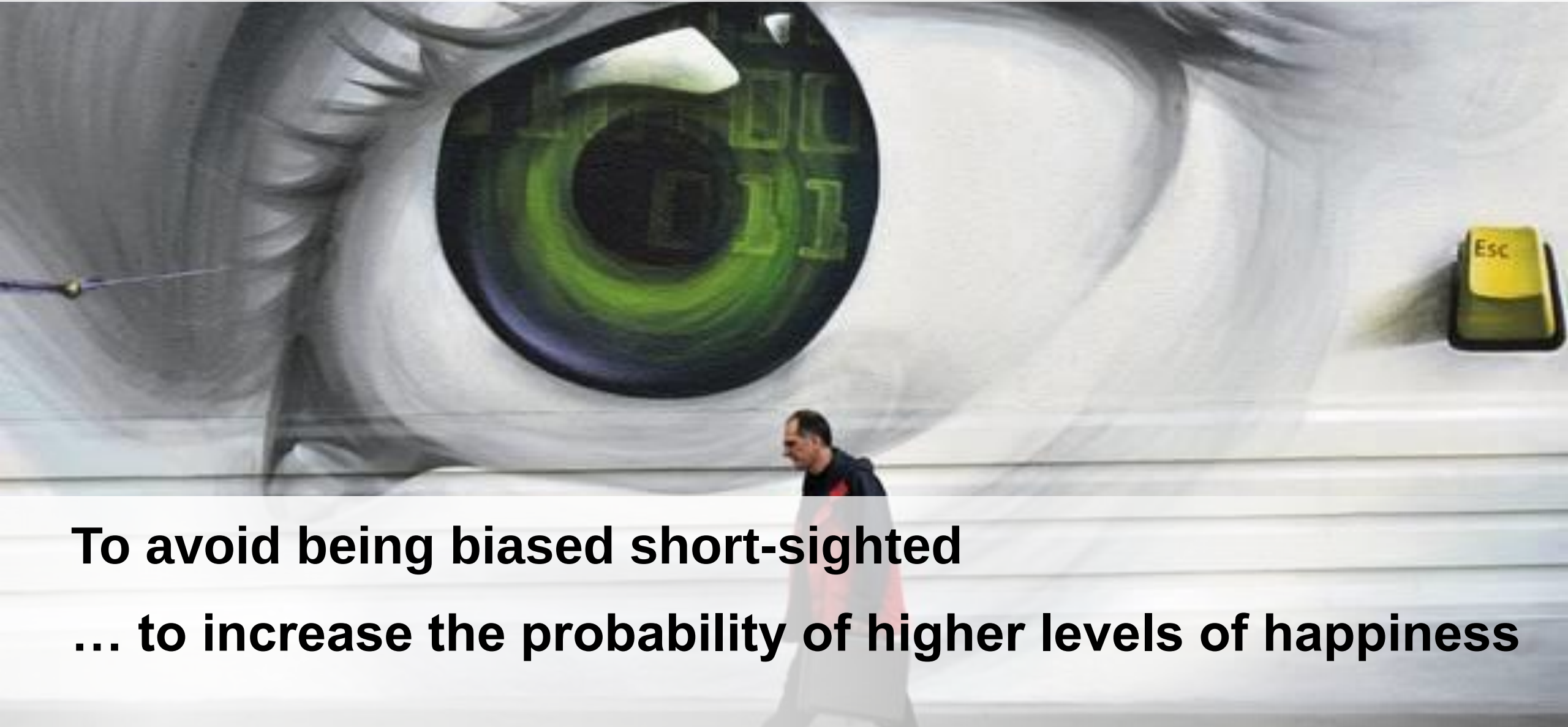
Q4: Why are each of these statements FALSE?

a) **If a student who graduates from university ends up being in exactly the same job (with the same pay) that they would have had if they hadn't gone to university, then this is proof that going to university was a bad decision for that student.**

b) **Investor A achieved a higher return than investor B over the last 5 years. This proves that the investment decisions of investor A were better than investor B.**

Setting goals

Why set goals?



To avoid being biased short-sighted

… to increase the probability of higher levels of happiness

Goals should be SMART

Specific - detailed enough so that you can visualise it

Measurable – quantified so you can assess progress

Achievable – realistic given your skills and resources

Relevant – is worthwhile pursuing

Time-bound – specify a date by which it will be achieved

2 types of goals

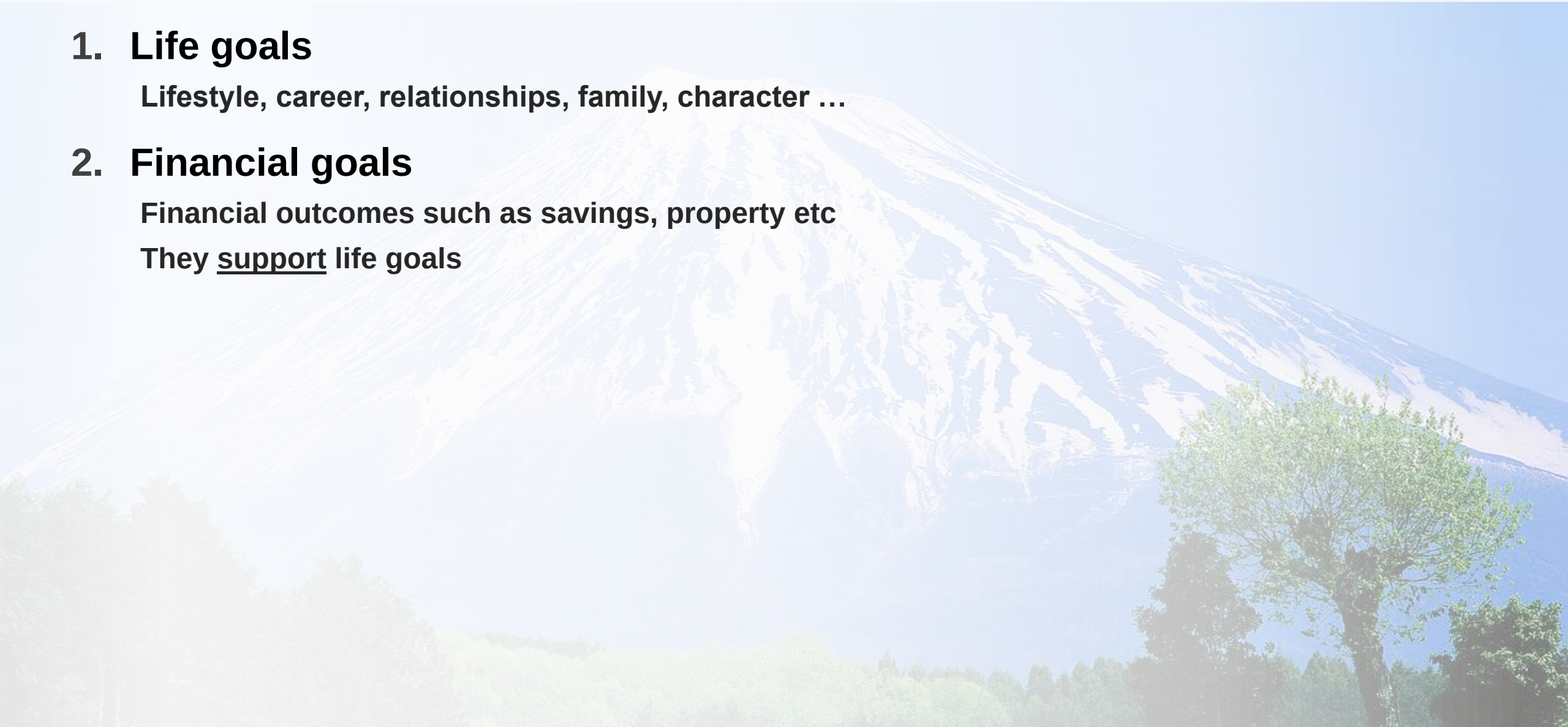
1. **Life goals**

   Lifestyle, career, relationships, family, character …

2. **Financial goals**

   Financial outcomes such as savings, property etc

   They support life goals



1. Life goal examples

To get married to someone who is kind, caring and intelligent by 31 Dec 202X.

To travel for 6 months through Europe after I graduate from my undergraduate degree leaving by 31 Jan 201X.

To secure a 3 month contract after completing my degree in Sydney by 30 Jun 201X earning $50,000 p.a. for one of the following 3 companies: A, B or C.

To make progress in my leadership skills by volunteering to lead on O-Week Activities in Feb 201X.

To meet with a UNSW counsellor at least 3 times before 31 Dec 201X to talk about my procrastination issues.

To enrol in an MBA with AGSM (UNSW) by 31 Dec 202X to develop my management knowledge and skills.

2. Financial goal examples

To save a permanent savings buffer of $5,000 in my bank account by 31 Dec 201X and for the average balance to remain above that in the following year.

To save $80,000 for a deposit on a home by 31 Dec 201X.

To buy a 2 bedroom apartment in Liverpool for less than $400,000 by 31 Dec 201X.

To accumulate $20,000 in superannuation by age 25.

To make sure that my personal income is protected against accident or illness

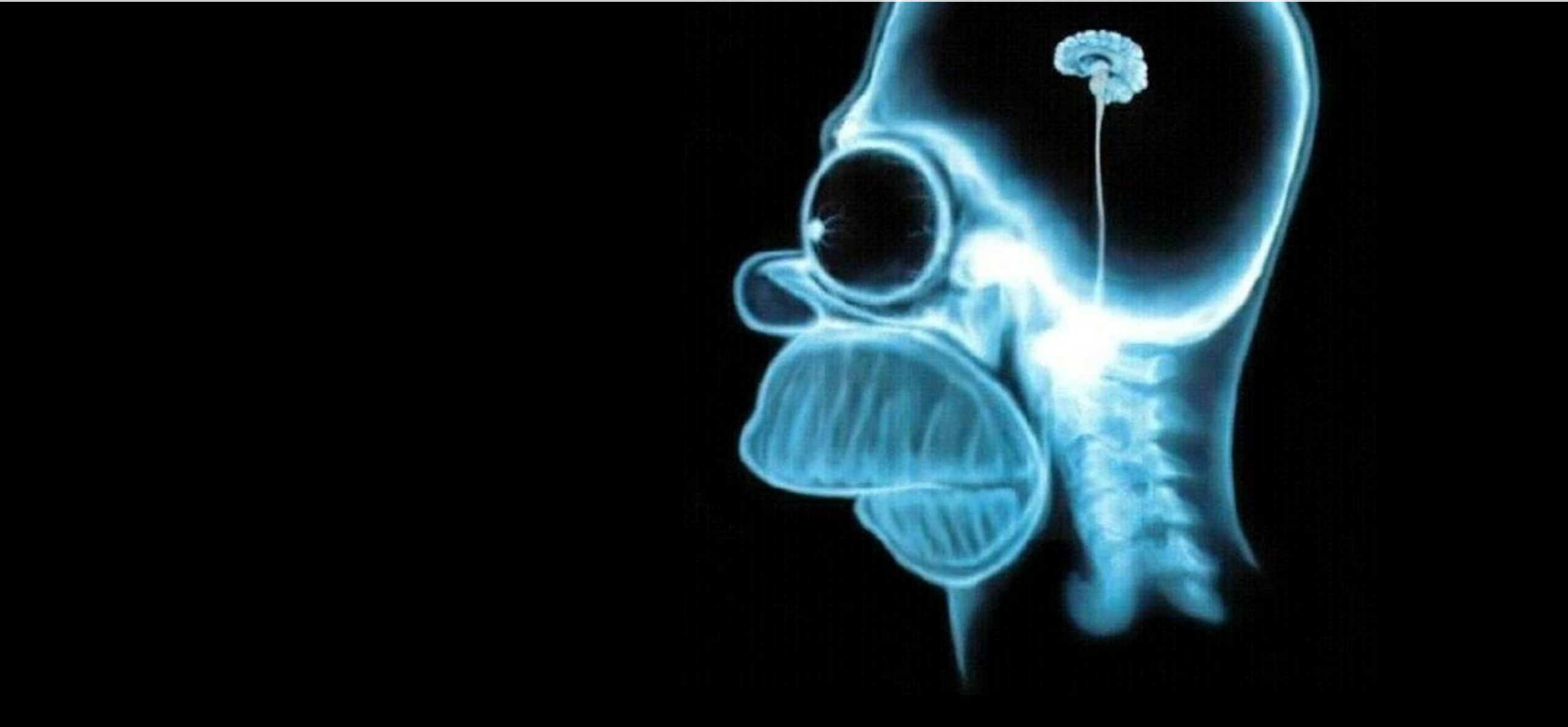
Time-frame

1. **Short-term <1 year**
   - Low uncertainty with situation
   - High detail in goals
   - Roughly 40% of goals
2. **Medium-term 1 to 5 years**
   - Moderate uncertainty with situation
   - Moderate detail in goals
   - Roughly 40% of goals
3. **Long-term 5+ years**
   - High uncertainty with situation
   - Low to moderate detail in goals
   - Roughly 20% of goals

Why setting goals increases happiness

1. Provides a sense of purpose

2. Allows us to manage short-term biases



3. Pursuing goals develops self-discipline

4. Planning process uncovers new alternatives

5. Increases probability of achieving goals

6. Anticipation = free happiness

7. Goals = happy parents = less intervention

Q5: Identify some goals

Write down some life and financial goals that will move you towards that age 60 situation.

	Life goals	Financial goals
Short-term (< 1 year)		
Medium-term (1-5 years)		
Long-term (5+ years)		

Andrew Hingston

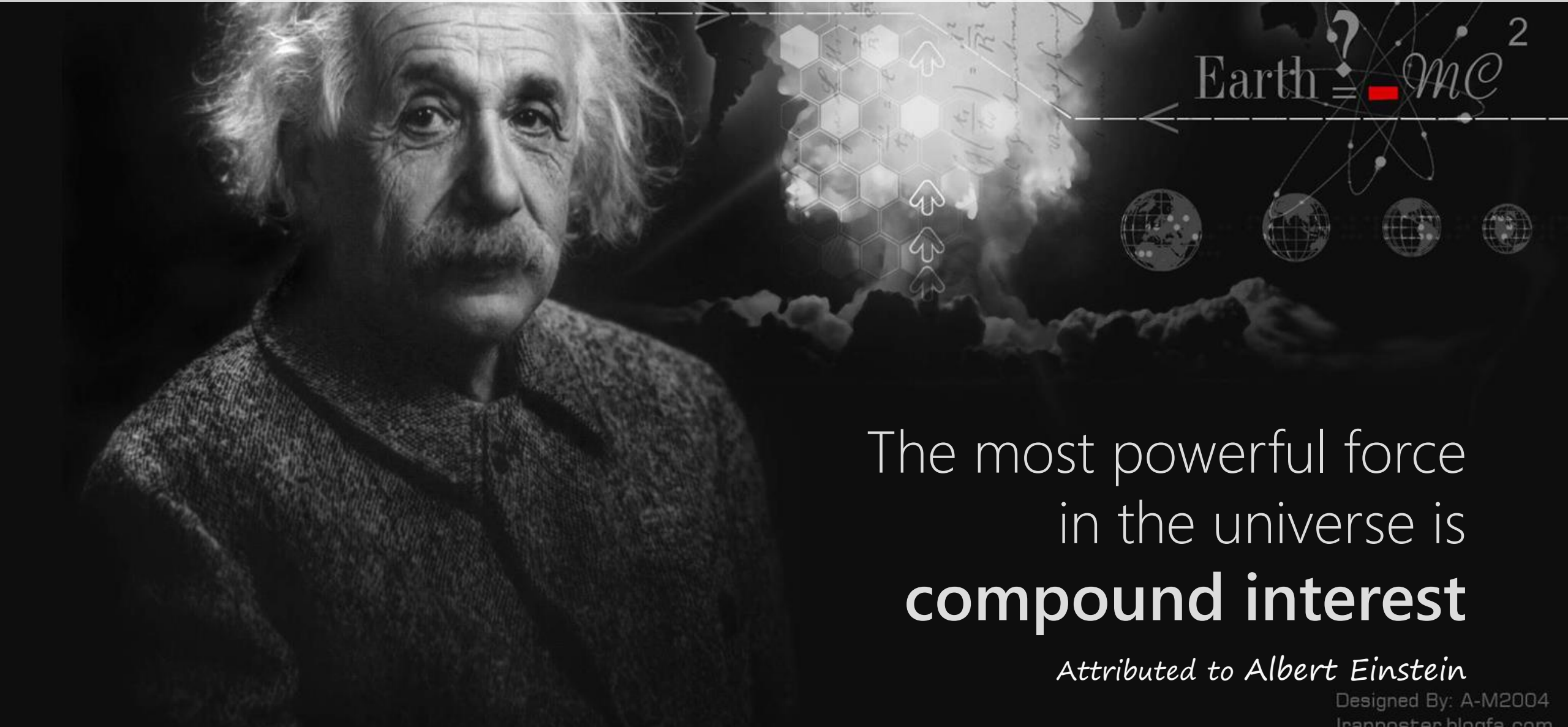
Planning to save

Think and discuss

We all studied a lot of mathematics at school

Have you used mathematics for something useful since you left school?

Quote


Earth = mc 2
The most powerful force
in the universe is
compound interest
Attributed to Albert Einstein
Designed By: A-M2004

Andrew Hingston

Compound interest = future value

Remember simple and compound interest from school?

Simple interest

Interest is calculated on principal amount saved only

Compound interest

Interest is calculated based on both principal and past interest

In this course we will always use compound interest

Let's have some fun with

financial mathematics

Future value of a single amount

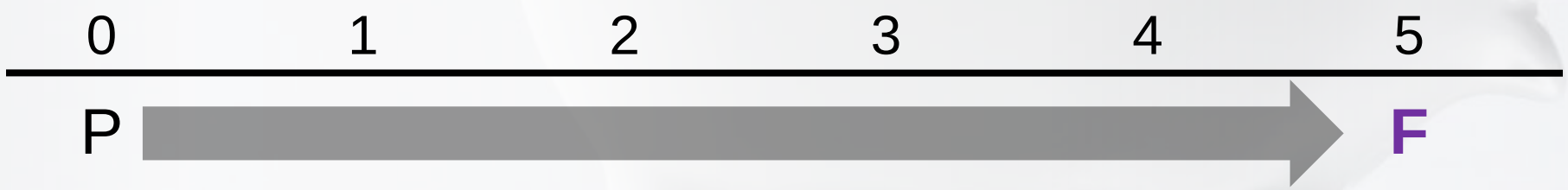
The equivalent future value (F)

at some stage in the future (n periods)

of a single amount invested now (P)

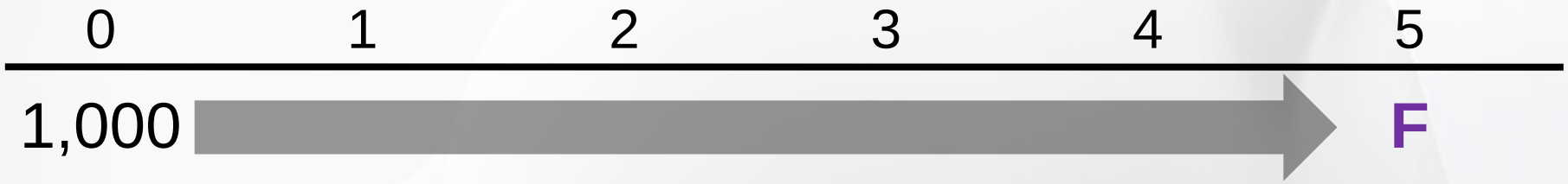
at a rate of return of ‘r’ per period.

$$F = P \times (1 + r)^n$$



Example of future value of single amount

How much money will Susan have in her savings account in 5 years if she deposits $1,000 now at an interest rate of 6% pa?



$$F = P \times (1 + r)^n$$

$$= 1{,}000 \times 1.06^5$$

$$= 1{,}338.23$$

1000×1.06 $x^{\blacksquare}$ 5 ▶ =

= FV (0.06, 5, 0, 1000)

What is an annuity?

Regular series of cash flows

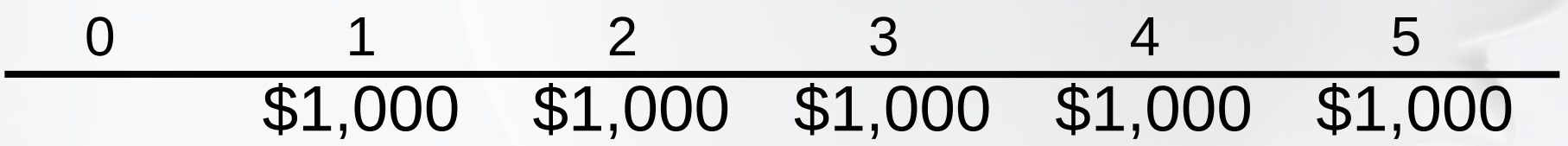
Cash flows are all the same

First cash flow is saved in one period

If first saving amount is today then it should be handled separately

There is a final cash flow

No missing amounts in the middle



Andrew Hingston

Future value of an annuity (S)

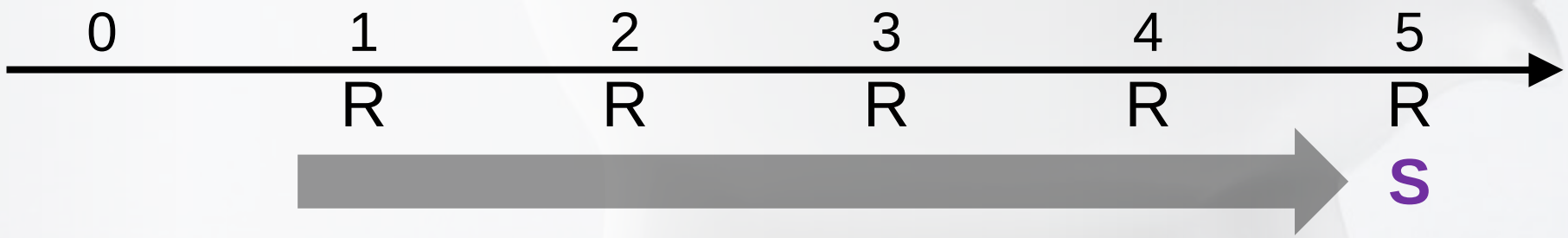
The future value (S)

of a set of regular identical cash flows (R)

paid for n periods

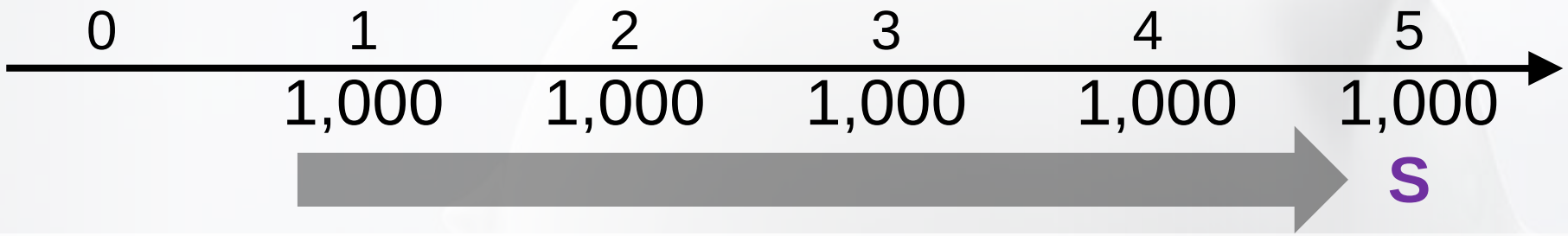
with a return of r per period

$$S = R \times \left(\frac{(1+r)^n - 1}{r} \right)$$



Example of future value of an annuity

How much will Susan have in her account in 5 years if she puts in $1,000 at the end of each year for the next 5 years at an interest rate of 6%pa?



$$S = R \times \left(\frac{(1+r)^n - 1}{r} \right)$$

$$= 1{,}000 \times \left(\frac{1.06^5 - 1}{0.06} \right)$$

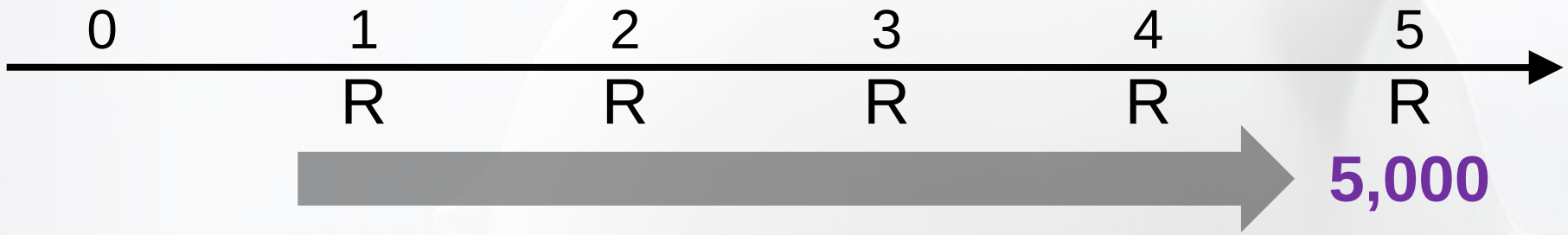
$$= 5{,}637.09$$

1000 × ((1.06 $x^{\blacksquare}$ 5 ▶ – 1) ÷ .06) =

= FV (0.06, 5, 1000, 0)

Future value annuity with unknown payment (R)

How much will Susan need save at the end of each year to have $5,000 in the account after 5 years at an interest rate of 6%pa?



$$R = S \div \left(\frac{(1+r)^n - 1}{r} \right)$$

$$R = 5{,}000 \div \left(\frac{1.06^5 - 1}{0.06} \right)$$

$$= 886.98$$

5000 ÷ ((1.06 $x^{\blacksquare}$ 5 ▶ – 1) ÷ .06) =

= PMT (0.06, 5, 0, 5000)

5 reasons why planning to save matters

1. **If you can't do the mathematics then you won't ever have a deep understanding of the concept**
2. **You can calculate regular savings amount for your own financial plan**
3. **Key concept behind financial independence**
4. **You can use it to help your parents plan for retirement**
5. **Because this is a university course and we expect a deeper understanding of the concepts**

Recap

1. **Future value of a single amount**

$$F = P \times (1 + r)^n$$

2. **Future value of regular savings plan**

$$S = R \times \left(\frac{(1 + r)^n - 1}{r} \right)$$

3. **Payment for a regular savings plan**

$$R = S \div \left(\frac{(1 + r)^n - 1}{r} \right)$$

Andrew Hingston

Q6: Planning to save

a) **You already have $10,000 in your savings account. How much will you need to set aside for a $3,000 holiday in 2 years if the interest rate is 6% per year compounded monthly (0.5% per month)?**

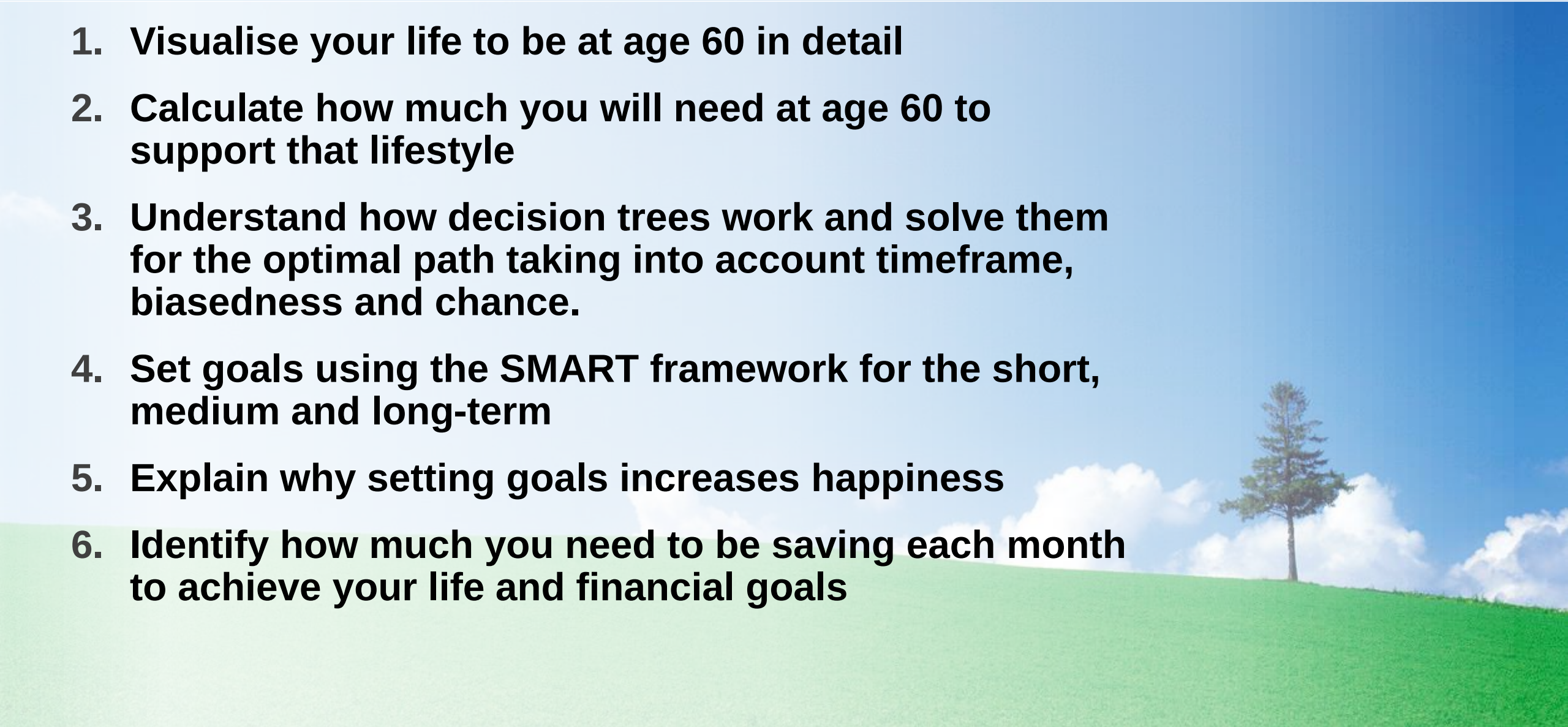
b) **A 20 year old starts saving $100 every month and invests it at a return of 12% per year (1% per month). How much will she have at age 60 (after 480 months)?**

c) **A 20 year old has decided that they need $1 million to be financial independent at age 60 (40 years). They can invest at return of 12% per year. How much do they need to save each year to achieve this goal?**

Go to Answer

You need to be able to …

1. Visualise your life to be at age 60 in detail
2. Calculate how much you will need at age 60 to support that lifestyle
3. Understand how decision trees work and solve them for the optimal path taking into account timeframe, biasedness and chance.
4. Set goals using the SMART framework for the short, medium and long-term
5. Explain why setting goals increases happiness
6. Identify how much you need to be saving each month to achieve your life and financial goals



A2: Modelling financial independence

a) $$A_{\infty,g} = \frac{R_1}{(r-g)} = \frac{100,000}{0.065} = 1,538,462$$

b) $$A_{\infty,g} = \frac{R_1}{(r-g)} = \frac{100,000}{0.065 + 0.02} = 1,176,471$$

c) **No answer provided**
Use a similar approach to answer 1 above

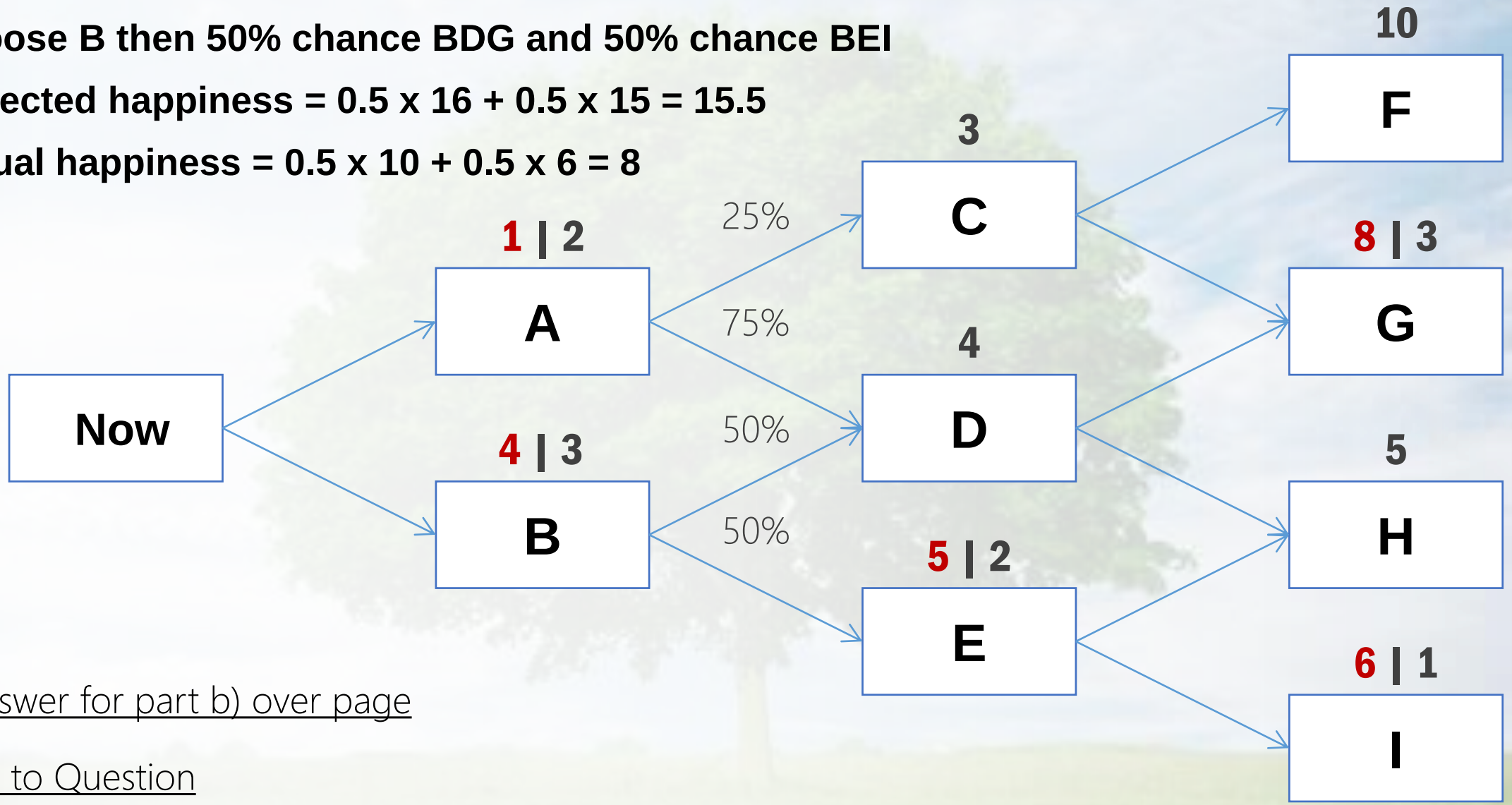
Go to Question

A3a: Biased and short-sighted (tough)

Choose B then 50% chance BDG and 50% chance BEI

Expected happiness = 0.5 x 16 + 0.5 x 15 = 15.5

Actual happiness = 0.5 x 10 + 0.5 x 6 = 8



Answer for part b) over page

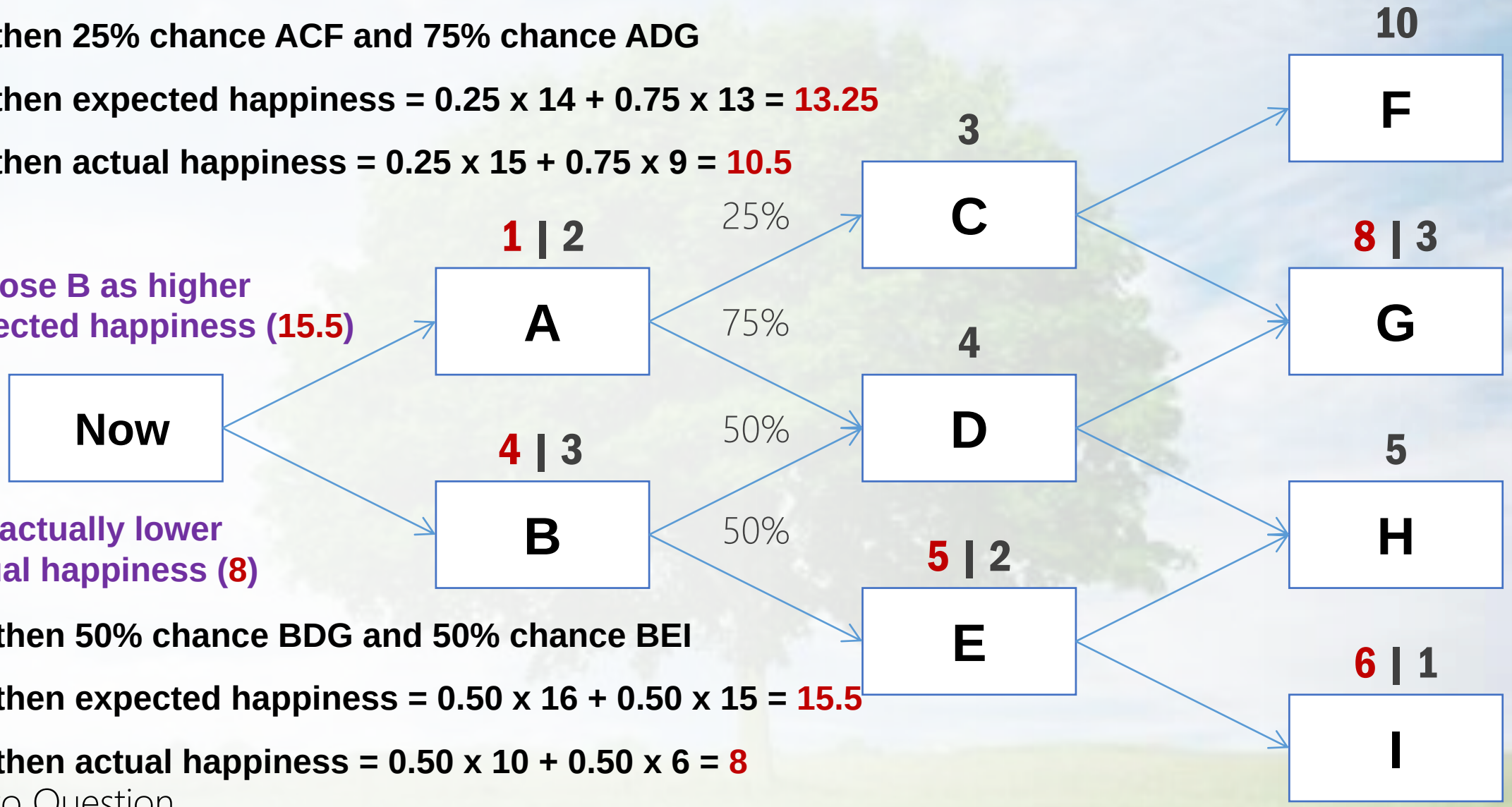
Go to Question

A3b: Biased and long-sighted (very tough)

If A then 25% chance ACF and 75% chance ADG

If A then expected happiness = 0.25 x 14 + 0.75 x 13 = 13.25

If A then actual happiness = 0.25 x 15 + 0.75 x 9 = 10.5



If B then 50% chance BDG and 50% chance BEI

If B then expected happiness = 0.50 x 16 + 0.50 x 15 = 15.5

If B then actual happiness = 0.50 x 10 + 0.50 x 6 = 8

Go to Question

A6: Planning to save

a)

$$F = P \times (1 + r)^n$$

$$3{,}000 = P \times 1.005^{24}$$

$$P = 3{,}000 \div 1.005^{24} = 2{,}661.56$$

b)

$$S = R \times \left(\frac{(1 + r)^n - 1}{r} \right) = 100 \times \left(\frac{1.01^{480} - 1}{0.01} \right) = 1{,}176{,}477$$

c)

$$R = S \div \left(\frac{(1 + r)^n - 1}{r} \right) = 1{,}000{,}000 \div \left(\frac{1.12^{40} - 1}{0.12} \right) = 1{,}303.63$$

Go to Question