

**Chapter 19: Worksheet mark scheme (21 marks, HL 21 + 12)**

1 Machine A costs \$700,000 and has forecast net cash flows of:

\$50,000 in year 1

\$100,000 in year 2

\$350,000 in year 3

\$500,000 in year 4

The machine is high quality and has excellent user reports of good levels of customer service and high reliability.

Machine B costs \$800,000 and has annual forecast net cash flows of:

\$600,000 in year 1

\$350,000 in year 2

\$50,000 in year 3

\$50,000 in year 4

\$50,000 in year 5

The machine is produced by a new company and takes advantage of exciting new technological developments.

Calculate cumulative cash flows ( $2 \times 2$  marks), the average rate of return (ARR) ( $2 \times 3$  marks) and payback period in months (PP) ( $2 \times 3$  marks) for each project. **(14)**

**Machine A**

Year	Cash flow \$000	Cumulative cash flow \$000
0	(700)	(700)
1	50	(650)
2	100	(550)
3	350	(200)
4	500	300
<b>Total</b>	300	300

Award 2 marks for correctly calculating cumulative cash flows.

$$\text{ARR} = \frac{\text{final cumulative cash flow}}{\text{initial investment}} \times 100\%$$

$$= \frac{300}{700} \times 100\%$$

$$= 42.9\%$$

Award 1 mark for the word equation, 1 mark for correct selection of numbers and 1 mark for correct answer.

$$\text{PP} = 3 \text{ years and } \frac{\text{Year 3 cumulative cash flow shortfall} \times 12 \text{ months}}{\text{Year 4 cash flow}}$$

$$= 3 \text{ years and } \frac{(200) \times 12 \text{ months}}{(500)}$$

$$= 3 \text{ years and } 4.8 \text{ months}$$

Award 1 mark for the word equation, 1 mark for correct selection of numbers and 1 mark for correct answer.

**Machine B**

Year	Cash flow \$000	Cumulative cash flow \$000
0	(800)	(800)
1	600	(200)
2	350	150
3	50	200
4	50	250
5	50	300
<b>Total</b>	300	300

Award 2 marks for correctly calculating cumulative cash flows

$$\begin{aligned}
 \text{ARR} &= \frac{\text{final cumulative cash flow}}{\text{initial investment}} \times 100\% \\
 &= \frac{300}{800} \times 100\% \\
 &= 37.5\%
 \end{aligned}$$

Award 1 mark for the word equation, 1 mark for correct selection of numbers and 1 mark for correct answer.

$$\begin{aligned}
 \text{PP} &= 1 \text{ years and } \frac{\text{Year 1 cumulative cash flow shortfall} \times 12 \text{ months}}{\text{Year 2 cash flow}} \\
 &= 1 \text{ years and } \frac{(200) \times 12 \text{ months}}{(350)} \\
 &= 1 \text{ year and 6.9 months}
 \end{aligned}$$

Award 1 mark for the word equation, 1 mark for correct selection of numbers and 1 mark for correct answer.

- 2** Using PP, ARR and information given, state **two** quantitative and **two** qualitative considerations which should be taken into account before making a choice of machine. **(4)**

Quantitative considerations:

- Machine B has an ARR 5.4% lower than machine A
- Machine A pays back almost two years faster than machine B

Qualitative considerations

- Machine A has solid reliability and good service reputation
- Machine B has new technology (but may not be reliable)

- 3** State **one** weakness of investment appraisal. **(1)**

It is based on cash-flow forecasts, which may not be accurate.

- 4 (HL) Calculate the NPV for both projects at 6% discount, using the discount factors below.  
(4 × 2)

Year	Discount factor
1	0.94
2	0.89
3	0.84
4	0.79
5	0.75

#### Machine A

Year	Cash flow × discount factor \$000	(NPV) \$000
0	$(700) \times 1$	(700)
1	$50 \times 0.94$	47
2	$100 \times 0.89$	89
3	$350 \times 0.84$	294
4	$500 \times 0.79$	395
<b>Total</b>	$300 \times 0.75$	926

#### Machine B

Year	Cash flow \$000	Cumulative cash flow \$000
0	$(800) \times 1$	(800)
1	$600 \times .94$	564
2	$350 \times .89$	311.5
3	$50 \times .84$	42
4	$50 \times .79$	39.5
5	$50 \times .75$	37.5
<b>Total</b>	300	994.5

4 marks are available for each machine.

**4 marks:**

Completely correct with all calculations clearly shown.

**3 marks:**

One minor error.

**2 marks:**

Two minor errors.

**1 mark:**

Shows some understanding of concepts but has several errors.

5 **(HL)** You have just applied discount factors to your calculations.

**a** What is a discount factor? (2)

This is an adjustment made to future sums of money or cash flows in order to calculate their present value.

**b** What **two** things does the discount factor depend on? (2)

- The higher the interest rate, the less value future cash has in today's money.
- The longer it takes before the cash is received, the less value it has compared to today's money.