Answers

1 **(a)** Calculation of net present value (NPV)

Year	1	2	3	4	5	6
	$000	$000	$000	$000	$000	$000
Sales revenue	1,600	1,600	1,600	1,600	1,600	
Variable costs	(1,100)	(1,100)	(1,100)	(1,100)	(1,100)	
Contribution	500	500	500	500	500	
Fixed costs	(160)	(160)	(160)	(160)	(160)	
Taxable cash flow	340	340	340	340	340	
Tax liabilities		(102)	(102)	(102)	(102)	(102)
After-tax cash flow	340	238	238	238	238	(102)
Working capital					90	
Scrap value					40	
Net cash flow	340	238	238	238	368	(102)
Discount factors	0·901	0·812	0·731	0·659	0·593	0·535
Present values	306	193	174	157	218	(55)

	$000
Present value of cash inflows	993
Working capital investment	(90)
Cost of machine	(800)
NPV	103

Since the investment has a positive NPV, it is financially acceptable.

Alternative layout of NPV calculation

	$000
PV of sales revenue = 100,000 x 16 x 3·696 =	5,914
PV of variable costs = 100,000 x 11 x 3·696 =	(4,066)
PV of contribution	1,848
PV of fixed costs = 160,000 x 3·696 =	(591)
PV of taxable cash flow	1,257
PV of tax liabilities = (340,000 x 0·3 x 3·696) x 0·901 =	(340)
	917
PV of working capital recovered = 90,000 x 0·593 =	53
PV of scrap value = 800,000 x 0·05 x 0·593 =	24
PV of cash inflows	994
Initial working capital investment	(90)
Initial purchase cost of new machine	(800)
Net present value	104

(b) Calculation of internal rate of return (IRR)

NPV at 11% was found to be $103,000

NPV at 17%:

Net cash flow	340	238	238	238	368	(102)
Discount factors	0·855	0·731	0·624	0·534	0·456	0·390
Present values	291	174	149	127	168	(40)

	$000
Present value of cash inflows	869
Working capital investment	(90)
Cost of machine	(800)
NPV	(21)

IRR = 11 + (((17 – 11) x 103,000)/(103,000 + 21,000)) = 11 + 5·0 = 16·0%

Since the internal rate of return of the investment (16%) is greater than the cost of capital of Warden Co, the investment is financially acceptable.

Examiner's note: *although the value of the calculated IRR will depend on the two discount rates used in linear interpolation, other discount rate choices should produce values close to 16%.*

(c) Sensitivity analysis indicates which project variable is the key or critical variable, i.e. the variable where the smallest relative change makes the net present value (NPV) zero. Sensitivity analysis can show where management should focus attention in order to make an investment project successful, or where underlying assumptions should be checked for robustness.

The sensitivity of an investment project to a change in a given project variable can be calculated as the ratio of the NPV to the present value (PV) of the project variable. This gives directly the relative change in the variable needed to make the NPV of the project zero.

Selling price sensitivity
The PV of sales revenue = 100,000 x 16 x 3·696 = $5,913,600
The tax liability associated with sales revenue needs be considered, as the NPV is on an after-tax basis.
Tax liability arising from sales revenue = 100,000 x 16 x 0·3 = $480,000 per year
The PV of the tax liability without lagging = 480,000 x 3·696 = $1,774,080
(Alternatively, PV of tax liability without lagging = 5,913,600 x 0·3 = $1,774,080)
Lagging by one year, PV of tax liability = 1,774,080 x 0·901 = $1,598,446
After-tax PV of sales revenue = 5,913,600 – 1,598,446 = $4,315,154
Sensitivity = 100 x 103,000/4,315,154 = 2·4%

Discount rate sensitivity
Increase in discount rate needed to make NPV zero = 16 – 11 = 5%
Relative change in discount rate needed to make NPV zero = 100 x 5/11 = 45%

Of the two variables, the key or critical variable is selling price, since the investment is more sensitive to a change in this variable (2·4%) than it is to a change in discount rate (45%).

(d) In real-world capital investment decisions, companies are limited in the funds that are available for investment. However, the basis for investment decisions should still be to maximise the wealth of shareholders. The NPV decision rule calls for a company to invest in all projects with a positive net present value, but this is theoretically possible only in a perfect capital market, i.e. a capital market where there is no limit on the finance available. Since investment funds are limited in the real world, it is not possible in the real world for a company to invest in all projects with a positive NPV.

The reasons why investment funds are limited in the real world are either external to the company (hard capital rationing) or internal to the company (soft capital rationing).

Several reasons have been suggested for hard capital rationing, such as that investors may feel that a company is too risky to invest in, with its credit rating being seen as too low for the amount of investment it needs. Perhaps capital markets may be depressed, so that there is a general unwillingness by investors to provide funds for capital investment. Capital may be in short supply due to 'crowding-out' as a result of high government borrowing, for example in order to finance a Keynsian injection of funds into the circular flow of income so as to encourage or assist recovery from an economic recession.

Soft capital rationing may be due to reluctance by a company to raise finance. For example, the amount of funds needed may be small in relation to the costs of raising the finance: or the company may wish to avoid dilution of control or earnings per share by issuing new equity; or the company may wish to avoid a commitment to paying fixed interest because it believes future economic conditions may put its profitability under pressure. Alternatively, the company may limit the funds available for capital investment in order to encourage competition between potential investment projects, so that only robust investment projects are accepted. This is the 'internal capital market' reason for soft capital rationing.

If a company cannot invest in all projects with a positive NPV, it must ensure that it generates the maximum return per dollar invested. With single-period capital rationing, where investment funds are limited in the first year only, divisible investment projects can be ranked in order of desirability using the profitability index. This can be defined either as the NPV divided by the initial investment, or as the present value of future cash flows divided by the initial investment. The optimal investment decision for a company is then to invest in the projects in turn, moving from highest profitability index downwards, until all the funds have been exhausted. This may require partial investment in the last desirable project selected, which is possible with divisible investment projects.

Where investment projects are not divisible, the total NPV of various combinations of projects must be compared, within the limit of the investment funds available, in order to select the combination of projects with the highest NPV. This will be the optimum investment decision. Surplus funds may be left over, but since the highest-NPV combination has been selected, the amount of surplus funds is irrelevant to the selection of the optimal investment schedule. Investing these surplus funds in a bank or in the money market would have an NPV of zero.

2 **(a)** The cash operating cycle is the average length of time between paying trade payables and receiving cash from trade receivables. It is the sum of the average inventory holding period, the average production period and the average trade receivables credit period, less the average trade payables credit period. Using working capital ratios, the cash operating cycle is the sum of the inventory turnover period and the accounts receivable days, less the accounts payable days.

The relationship between the cash operating cycle and the level of investment in working capital is that an increase in the length of the cash operating cycle will increase the level of investment in working capital. The length of the cash operating cycle depends on working capital policy in relation to the level of investment in working capital, and on the nature of the business operations of a company.

Working capital policy
Companies with the same business operations may have different levels of investment in working capital as a result of adopting different working capital policies. An aggressive policy uses lower levels of inventory and trade receivables than a conservative policy, and so will lead to a shorter cash operating cycle. A conservative policy on the level of investment in working capital, in contrast, with higher levels of inventory and trade receivables, will lead to a longer cash operating cycle. The higher cost of the longer cash operating cycle will lead to a decrease in profitability while also decreasing risk, for example the risk of running out of inventory.

Nature of business operations
Companies with different business operations will have different cash operating cycles. There may be little need for inventory, for example, in a company supplying business services, while a company selling consumer goods may have very high levels of inventory. Some companies may operate primarily with cash sales, especially if they sell direct to the consumer, while other companies may have substantial levels of trade receivables as a result of offering trade credit to other companies.

(b) Inventory days = 365 x 4,500/16,400 = 100 days
Trade receivables days = 365 x 3,500/21,300 = 60 days
Trade payables days = 365 x 3,000/16,400 = 67 days
Cash operating cycle = 100 + 60 – 67 = 93 days

(c) Calculation of value of with-recourse offer

As the factor's offer is with recourse, Bold Co will gain the benefit of bad debts reducing from 0·9% of turnover to 0·6% of turnover.

	$
Current trade receivables	3,500,000
Revised trade receivables = 21,300,000 x 35/365 =	2,042,466
Reduction in trade receivables under factor	1,457,534

	$
Finance cost saving = 1,457,534 x 0·07 =	102,027
Administration cost saving	40,000
Bad debt saving = 21,300,000 x (0·009 – 0·006) =	63,900
Total saving	205,927
Additional interest on advance = 2,042,466 x 0·8 x 0·02 =	32,680
Net benefit before factor fee	173,247
With-recourse factor fee = 21,300,000 x 0·0075 =	159,750
Net benefit of with-recourse offer	13,497

Calculation of value of non-recourse offer

As the offer is without recourse, the bad debts of Bold Co will reduce to zero, as these will be carried by the factor, and so the company will gain a further benefit of 0·6% of turnover.

	$
Net benefit before with-recourse factor fee	173,247
Non-recourse factor fee = 21,300,000 x 0·0125 =	266,250
Net cost before adjusting for bad debts	(93,003)
Remaining bad debts eliminated = 21,300,000 x 0·006 =	127,800
Net benefit of non-recourse offer	34,797

(d) The factor's offer is financially acceptable on a with-recourse basis, giving a net benefit of $13,497. On a non-recourse basis, the factor's offer is not financially acceptable, giving a net loss of $93,003, if the elimination of bad debts is ignored. The difference between the two factor fees ($106,500 or 0·5% of sales), which represents insurance against the risk of bad debts, is less than the remaining bad debts ($127,800 or 0·6% of sales), which will be eliminated under non-recourse factoring. When this elimination of bad debts is considered, the non-recourse offer from the factor is financially more attractive than the with-recourse offer.

There are a number of benefits of factoring that could be discussed, as follows.

The expertise of the factor
It is possible the factor can improve the efficiency of the receivables management of Bold Co due to its expertise in the areas of credit analysis, credit control and receivables collection. This would lead to a lower level of bad debts, as indicated by the factor's offer.

Insurance against bad debts
Non-recourse factoring offers protection from bad debts, although the factor's fee will include the cost of this insurance element, as indicated by the difference between the factor's fees.

Factor finance
A factor will advance up to 80% of the value of invoices raised, allowing a company quicker access to cash from sales than would be possible if it had to wait for accounts receivable to be settled. Bold Co could pay trade payables promptly, perhaps benefiting from early settlement discounts.

Lower administration costs
Since administration of trade receivables would be taken over by the factor, administration costs of the company would decrease over time, although some incremental short-term costs, such as redundancy costs, might be incurred.

3 (a) Net asset valuation
In the absence of any information about realisable values and replacement costs, net asset value is on a book value basis. It is the sum of non-current assets and net current assets, less long-term debt, i.e. 595 + 125 – 70 – 160 = $490 million.

Dividend growth model
Total dividends of $40 million are expected to grow at 4% per year and Close Co has a cost of equity of 10%.
Value of company = (40m x 1·04)/(0·1 – 0·04) = $693 million

Earnings yield method
Profit after tax (earnings) is $66·6 million and the finance director of Close Co thinks that an earnings yield of 11% per year can be used for valuation purposes.
Ignoring growth, value of company = 66·6m/0·11 = $606 million

Alternatively, profit after tax (earnings) is expected to grow at an annual rate of 5% per year and earnings growth can be incorporated into the earnings yield method using the growth model.
Value of company = (66·6m x 1·05)/(0·11 – 0·05) = $1,166 million

Examiner's note: *full credit would be gained whether or not growth is incorporated in the earnings yield method.*

(b) The dividend growth model (DGM) is used widely in valuing ordinary shares and hence in valuing companies, but there are a number of weaknesses associated with its use.

The future dividend growth rate
The DGM is based on the assumption that the future dividend growth rate is constant, but experience shows that a constant dividend growth rate is, in reality, very rare. This may be seen as less of a problem if the future dividend growth rate is regarded as an average growth rate.

Estimating the future dividend growth rate is very difficult in practice and the DGM is very sensitive to small changes in this key variable. It is common practice to estimate the future dividend growth rate by calculating the historical dividend growth, but the assumption that the future will reflect the past is an easy one to challenge.

The cost of equity
The DGM assumes that the future cost of equity is constant, when in reality it changes quite frequently. The cost of equity can be calculated using the capital asset pricing model, but this model usually employs historical information, which may not reflect accurately expectations about the future.

Zero dividends
It is sometimes claimed that the DGM cannot be used when no dividends are paid, but this depends on whether dividends are expected in the future. If dividends are forecast to be paid from a future date, the dividend growth model can be applied at that point to calculate a share price, which can then be discounted to give the current ex dividend share price. Only in the case where no dividends are paid and no dividends are expected to be paid will the DGM have no application.

(c) Market value of equity
Close Co has 80 million shares in issue and each share is worth $8·50 per share.
The market value of equity is therefore 80 x 8·50 = $680 million

Cost of equity
This is given as 10% per year.

Market value of 8% bonds
The market value of each bond will be the present value of the expected future cash flows (interest and principal) that arise from owning the bond. Annual interest is 8% per year and the bonds will be redeemed at their nominal value of $100 per bond in six years' time. The before-tax cost of debt is given as 7% per year and this is used as a discount rate.

Present value of future interest = (8 x 4·767) = $38·14
Present value of future principal payment = (100 x 0·666) = $66·60
Ex interest bond value = 38·14 + 66·60 = $104·74 per bond
Market value of bonds = 120m x (104·74/100) = $125·7 million

After-tax cost of debt of 8% bonds
The before-tax cost of debt of the bonds is given as 7% per year.
After-tax cost of debt of bonds = 7 x (1 – 0·3) = 7 x 0·7 = 4·9% per year

Value of the 6% bank loan
The bank loan has no market value and so its book value of $40 million is used in calculating the weighted average cost of capital.

After-tax cost of debt of 6% bank loan
The interest rate of the bank loan can be used as its before-tax cost of debt.
After-tax cost of debt of bank loan = 6 x (1 – 0·3) = 6 x 0·7 = 4·2% per year

Calculation of weighted average after-tax cost of capital (WACC)
Total value of company = 680m + 125·7m + 40m = $845·7m

After-tax WACC = ((680m x 10) + (125·7m x 4·9) + (40 x 4·2))/845·7 = 9·0 % per year

Examiner's note: *the after-tax cost of debt of the 8% bonds could have been calculated using linear interpolation, although the result would be close to 4·9%.*

(d) The weighted average cost of capital (WACC) is the average return required by current providers of finance. The WACC therefore reflects the current risk of a company's business operations (business risk) and way in which the company is currently financed (financial risk). When the WACC is used as discount rate to appraise an investment project, an assumption is being made that the project's business risk and financial risk are the same as those currently faced by the investing company. If this is not the case, a marginal cost of capital or a project-specific discount rate must be used to assess the acceptability of an investment project.

The business risk of an investment project will be the same as current business operations if the project is an extension of existing business operations, and if it is small in comparison with current business operations. If this is the case, existing providers of finance will not change their current required rates of return. If these conditions are not met, a project-specific discount rate should be calculated, for example by using the capital asset pricing model.

The financial risk of an investment project will be the same as the financial risk currently faced by a company if debt and equity are raised in the same proportions as currently used, thus preserving the existing capital structure. If this is the case, the current WACC can be used to appraise a new investment project. It may still be appropriate to use the current WACC as a discount rate even when the incremental finance raised does not preserve the existing capital structure, providing that the existing capital structure is preserved on an average basis over time via subsequent finance-raising decisions.

Where the capital structure is changed by finance raised for an investment project, it may be appropriate to use the marginal cost of capital rather than the WACC.

4   (a)   Theoretical ex rights price

Rights issue price = 7·50 x 0·8 = $6·00 per share
Number of shares issued = $90m/6·00 = 15 million shares
Number of shares currently in issue = 60 million shares
The rights issue is on a 1 for 4 basis
Theoretical ex rights price = ((4 x 7·50) + (1 x 6·00))/5 = $7·20 per share

Alternatively, theoretical ex rights price = ((60m x 7·50) + (15m x 6·00))/75m = $7·20 per share, where 75 million is the number of shares after the rights issue.

(b)   Financial acceptability to shareholders of buying back bonds

The financial acceptability to shareholders of the proposal to buy back bonds can be assessed by calculating whether shareholder wealth is increased or decreased as a result.

The bonds are being bought back by Bar Co at their market value of $112·50 per bond, rather than their nominal value of $100 per bond. The total nominal value of the bonds redeemed will therefore be less than the $90 million spent redeeming them.

Nominal value of bonds redeemed = 90m x (100/112·50) = $80 million
Interest saved by redeeming bonds = 80m x 0·08 = $6·4 million per year

Earnings per share will be affected by the redemption of the bonds and the issue of new shares.
Revised profit before tax = 49m – (10m – 6·4m) = $45·4 million
Revised profit after tax (earnings) = 45·4m x 0·7 = $31·78 million
Revised earnings per share = 100 x (31·78m/75m) = 42·37 cents per share

Current earnings per share = 100 x (27m/60m) = 45 cents per share
Current price/earnings ratio = 750/45 = 16·7 times

The revised earnings per share can be used to calculate a revised share price if the price/earnings ratio is assumed to be constant.
Revised share price = 16·7 x 42·37 = 708 cents or $7·08 per share

This share price is less than the theoretical ex rights price per share ($7·20) and so the effect of using the rights issue funds to redeem the bonds is to decrease shareholder wealth. From a shareholder perspective, therefore, this use of the funds cannot be recommended.

However, this conclusion depends heavily on the assumption that the price/earnings ratio remains constant, as this ratio was used to calculate the revised share price from the revised earning per share. In reality, the share price after the redemption of bonds will be set by the capital market and it is this market-determined share price that will determine the price/earnings ratio, rather than the price/earnings ratio determining the share price. Since the financial risk of Bar Co has decreased following the redemption of bonds, the cost of equity is likely to fall and the share price is likely to rise, leading to a higher price/earnings ratio. If the share price increases to above the theoretical ex rights price per share, corresponding to an increase in the price/earnings ratio to more than 17 times (720/42·37), shareholders will experience a capital gain and so using the cash raised by the rights issue to buy back bonds will become financially acceptable from their perspective.

(c) Current interest coverage ratio = 49m/10m = 4·9 times
Revised interest coverage ratio = 49m/(10m – 6·4m) = 49m/3·6m = 13·6 times

Current debt/equity ratio = 100 x (125m/140m) = 89%

Revised book value of bonds = 125m – 80m = $45 million
Revised book value of equity = 140m + 90m – 10m = $220 million

A loss of $10 million is deducted here because $90 million has been spent to redeem bonds with a total nominal value (book value) of $80 million.
Revised debt/equity ratio = 100 x (45m/220m) = 20·5%

Redeeming bonds with a book value of $80m has reduced the financial risk of Bar Co, as shown by the significant reduction in gearing from 89% to 20·5%, and by the significant increase in the interest coverage ratio from 4·9 times to 13·6 times.

Examiner's note: *full credit would be given to a revised gearing calculation (19·6%) that omits the loss due to buying back bonds at a premium to nominal value.*

(d) A key financial objective for a stock exchange listed company is to maximise the wealth of shareholders. This objective is usually replaced by the objective of maximising the company's share price, since maximising the market value of the company represents the maximum capital gain over a given period. The need for dividends can be met by recognising that share prices can be seen as the sum of the present values of future dividends.

Maximising the company's share price is the same as maximising the equity market value of the company, since equity market value (market capitalisation) is equal to number of issued shares multiplied by share price. Maximising equity market value can be achieved by maximising net corporate cash income and the expected growth in that income, while minimising the corporate cost of capital. Listed companies therefore have maximising net cash income as a key financial objective.

Not-for-profit (NFP) organisations seek to provide services to the public and this requires cash income. Maximising net cash income is therefore a key financial objective for NFP organisations as well as listed companies. A large charity seeks to raise as much funds as possible in order to achieve its charitable objectives, which are non-financial in nature.

Both listed companies and NFP organisations need to control the use of cash within a given financial period, and both types of organisations therefore use budgets. Another key financial objective for both organisations is therefore to keep spending within budget.

The objective of value for money (VFM) is often identified in connection with NFP organisations. This objective refers to a focus on economy, efficiency and effectiveness. These three terms can be linked to input (economy refers to securing resources as economically as possible), process (resources need to be employed efficiently within the organisation) and output (the effective use of resources in achieving the organisation's objectives).

Described in these terms, it is clear that a listed company also seeks to achieve value for money in its business operations. There is a difference in emphasis, however, which merits careful consideration. A listed company has a profit motive, and so VFM for a listed company can be related to performance measures linked to output, e.g. maximising the equity market value of the company. An NFP organisation has service-related outputs that are difficult to measure in quantitative terms and so it focuses on performance measures linked to input, e.g. minimising the input cost for a given level of output.

Both listed companies and NFP organisations can use a variety of accounting ratios in the context of financial objectives. For example, both types of organisation may use a target return on capital employed, or a target level of income per employee, or a target current ratio.

Comparing and contrasting the financial objectives of a stock exchange listed company and a not-for-profit organisation, therefore, shows that while significant differences can be found, there is a considerable amount of common ground in terms of financial objectives.

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				Marks	Marks
1	**(a)**		Sales income	0·5	
			Variable costs	0·5	
			Fixed costs	0·5	
			Tax liabilities	1	
			Working capital recovered	0·5	
			Scrap value	0·5	
			Initial working capital investment	0·5	
			Initial investment	0·5	
			Discount factors	0·5	
			Net present value	1	
			Comment on financial acceptability	1	
					7
	(b)		Calculation of revised NPV	1	
			Calculation of IRR	2	
			Comment on financial acceptability	1	
					4
	(c)	**(i)**	Explanation of sensitivity analysis		1
		(ii)	After-tax present value of sales revenue	2	
			Selling price sensitivity	2	
			Discount rate sensitivity	1	
			Comment on findings	1	
					6
	(d)		Nature of the capital rationing problem	1–2	
			Causes of the capital rationing problem	3–4	
			Overcoming the capital rationing problem	2–4	
				Maximum	7
					25

			Marks	*Marks*
2	**(a)**	Explanation of cash operating cycle	1–2	
		Cash operating cycle and working capital policy	2–3	
		Cash operating cycle and business operations	2–3	
		Other relevant discussion	1–2	
		Maximum		7
	(b)	Inventory days	1	
		Trade payables days	1	
		Trade receivables days	1	
		Cash operating cycle	1	
				4
	(c)	Revised trade receivables	0·5	
		Reduction in trade receivables	0·5	
		Reduction in finance cost	1	
		Administration costs	0·5	
		Saving in bad debts	0·5	
		Interest on advance	1	
		With-recourse factor fee	0·5	
		Net benefit of with-recourse offer	0·5	
		Without-recourse factor fee	0·5	
		Elimination of bad debts	1	
		Net benefit of non-recourse offer	0·5	
				7
	(d)	Comment on financial acceptability of offer	1–2	
		Benefits of factoring (1–2 marks per benefit)	5–6	
		Maximum		7
				25
3	**(a)**	Net asset value	1	
		Dividend growth model value	2	
		Earnings yield method	2	
				5
	(b)	Dividend growth rate	2–3	
		The cost of equity	1–2	
		Zero dividends and other relevant discussion	1–2	
		Maximum		5
	(c)	Market value of equity	1	
		Market value per bond	2	
		Market value of bonds	1	
		After-tax cost of debt	1	
		After-tax cost of bank loan	1	
		Weighted average cost of capital	2	
				8
	(d)	Business risk	2–3	
		Financial risk	2–3	
		Project-specific discount rate	1–2	
		Marginal cost of capital	1–2	
		Maximum		7
				25

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			Marks	*Marks*
4	**(a)**	Rights issue price	1	
		Theoretical ex rights price	2	
				3
	(b)	Nominal value of bonds redeemed	1	
		Interest saved on redeemed bonds	1	
		Earnings per share after redemption	1	
		Current price/earnings ratio	1	
		Revised share price	1	
		Comment on acceptability to shareholders	1–2	
		Comment on constant price/earnings ratio	1–2	
		Maximum		7
	(c)	Current interest coverage	0·5	
		Revised interest coverage	1	
		Current debt/equity ratio	0·5	
		Revised debt/equity ratio	1	
		Comment on financial risk	1	
				4
	(d)	Maximising shareholder wealth	2–3	
		Maximising cash income	2–3	
		Controlling spending with budgets	2–3	
		Value for money	2–3	
		Other relevant discussion	2–3	
		Maximum		11
				25