



H03-30min Risk (Higher): 30-minute Pack

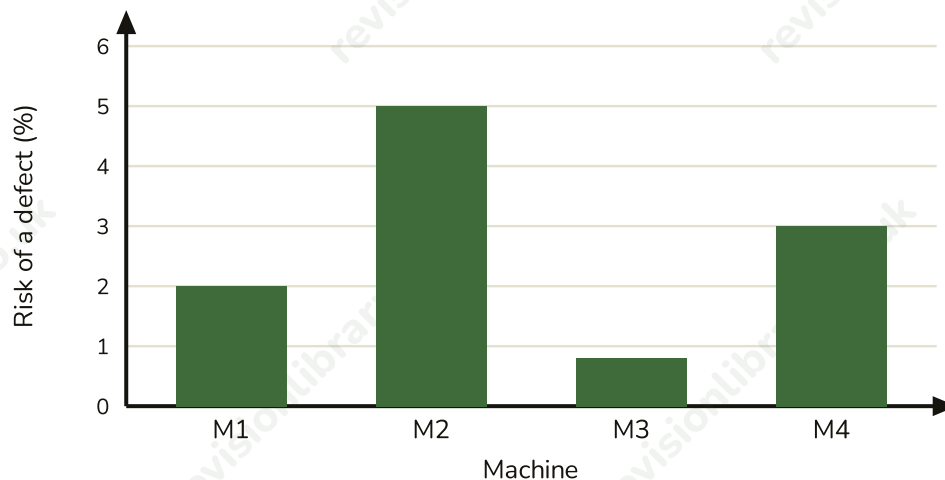
EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** The bar chart shows the risk of a printing defect, as a percentage, on four machines at a print factory.



- (a) Write down the risk of a defect on Machine M2. (1)
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- (b) Write down which machine has the lowest risk of a defect. (1)
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- (c) Machine M1 produces 4500 posters per day. Work out the number of defective posters expected from Machine M1 per day. (2)
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- (d) Machine M3 produces 12000 posters per day, and Machine M4 produces 2000 posters per day. Work out which machine is expected to produce more defective posters per day, showing your working. (3)

.....
(Total for Question 1 is 7 marks)

2 An allergy clinic records data on allergic reactions in two age groups.

Group	Number in group	Number with an allergic reaction
Children	400	20
Adults	1000	10

(a) Work out the absolute risk of an allergic reaction for a child, as a percentage. (2)

.....
(b) Work out the absolute risk of an allergic reaction for an adult, as a percentage. (2)

.....
(c) Work out the relative risk of an allergic reaction for a child compared with an adult. (2)

.....
(d) Explain the difference between absolute risk and relative risk, using your answers to parts a to c as an example. (1)

(Total for Question 2 is 7 marks)

3 In a particular year, the risk that a certain resident's house floods is 8%, and the independent risk that the house has a gas leak is 3%.

(a) Work out the probability that the resident experiences at least one of these two hazards during the year. **(3)**

(b) Write this risk approximately in the form 1 in n , giving n to the nearest whole number. **(2)**

(c) A resident says, "The risk of at least one hazard must just be $8\% + 3\% = 11\%$." **(1)**
Explain why this method is not exactly correct.

(Total for Question 3 is 6 marks)

- 4** A cycling club wants to investigate the claim: "Wearing the new lightweight helmet design reduces the risk of head injury compared with the standard helmet, in the event of a crash."
- (a)** Plan: Write a suitable question the club could use to plan this investigation. **(1)**
- (b)** Collect: The club decides to compare real crash records for two groups of cyclists, rather than testing helmets on crash-test dummies in a laboratory. Suggest one advantage of using real crash records for this investigation. **(1)**
- (c)** Process: In the study, 3000 cyclists wore the new helmet and 3000 wore the standard helmet. Of these, 12 new-helmet wearers and 30 standard-helmet wearers suffered a head injury in a crash during the year. Work out the relative risk of head injury for a standard-helmet wearer compared with a new-helmet wearer. **(3)**
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- (d)** Interpret: Write a conclusion, referring to your answer to part c, that the club could use to support or reject the original claim. **(2)**

(Total for Question 4 is 7 marks)

- 5** A savings and loans comparison website lists the risk of default (failing to repay) for three short-term loan products.

Loan A: odds against default = 24 to 1

Loan B: risk of default = 5%

Loan C: probability of default = $\frac{1}{12}$

- (a)** Work out the probability of default for Loan A, as a percentage. (2)

-
- (b)** Work out the probability of default for Loan C, as a percentage, correct to 1 decimal place. (2)

-
- (c)** Using your answers, and the risk given for Loan B, put the three loans in order of risk of default, from lowest to highest. (2)

- (d)** An investor says, "Loan A is the safest because its odds against default are the biggest number." Comment on whether this is a reliable way to judge risk in general. (1)

(Total for Question 5 is 7 marks)

Mark scheme • H03-30min Risk (Higher): 30-minute Pack

Question 1

- (a) **B1** 5% cao
- (a) **Answer: 5%**
- (b) **B1** M3 cao
- (b) **Answer: M3**
- (c) **M1** 4500×0.02 , oe
- (c) **A1** 90 cao
- (c) **Answer: 90**
- (d) **M1** 12000×0.008 , oe (= 96)
- (d) **M1** 2000×0.03 , oe (= 60)
- (d) **A1** M3 cao, with 96 and 60 both stated
- (d) **Answer: M3 (96 defective posters per day, compared with 60 for M4)**

Question 2

- (a) **M1** 20 divided by 400, oe
- (a) **A1** 5% cao
- (a) **Answer: 5%**
- (b) **M1** 10 divided by 1000, oe
- (b) **A1** 1% cao
- (b) **Answer: 1%**
- (c) **M1** 5% divided by 1%, oe
- (c) **A1** 5 (times) cao
- (c) **Answer: 5 times**
- (d) **B1** valid explanation, e.g. absolute risk is the actual chance of the event happening to one person in a group (5% for children, 1% for adults), while relative risk compares two absolute risks to show how many times more or less likely one group is (children are 5 times as likely as adults), oe
- (d) **Answer: Absolute risk is the actual chance for one person in a group (5% for children, 1% for adults); relative risk compares the two absolute risks (5% divided by 1% = 5), showing children are 5 times as likely to react.**

Question 3

- (a) **M1** 0.92×0.97 , oe (= 0.8924)
- (a) **dM1** 1 - their 0.8924, oe (dependent on the first method mark)
- (a) **A1** 10.76% cao
- (a) **Answer: 10.76%**
- (b) **M1** 1 divided by 0.1076, oe (or ft from part a)
- (b) **A1** 9 cao (awrt)
- (b) **Answer: approximately 1 in 9**
- (c) **B1** valid explanation, e.g. simply adding the risks double-counts the (small) chance that both hazards happen in the same year, so the correct method (1 minus the product of both 'does not happen' probabilities) gives the slightly lower value of 10.76% rather than 11%, oe
- (c) **Answer: Adding the risks double-counts the chance both hazards happen together; the correct combined risk is 10.76%, slightly less than 11%.**

Question 4

- (a) **B1** any suitable comparative question linking helmet type and head injury risk, e.g. 'Do cyclists wearing the new lightweight helmet have a lower risk of head injury in a crash than cyclists wearing the standard helmet?', oe
- (a) **Answer: e.g. Do cyclists wearing the new lightweight helmet have a lower risk of head injury in a crash than cyclists wearing the standard helmet?**
- (b) **B1** any suitable advantage, e.g. real crash records reflect genuine crash conditions and human factors, giving a more realistic estimate of risk than a controlled dummy test, oe
- (b) **Answer: e.g. Real crash records capture genuine crash conditions and behaviour, giving a more realistic estimate of risk than a controlled laboratory test.**
- (c) **M1** 0.4% and 1% found, oe (12/3000 and 30/3000 converted to percentages)
- (c) **dM1** 1% divided by 0.4%, oe (dependent on the first method mark)
- (c) **A1** 2.5 (times) cao
- (c) **Answer: 2.5 times**
- (d) **B1** conclusion consistent with the data supporting the claim
- (d) **B1** correctly references the relative risk figure from part c, e.g. 'This supports the claim: standard-helmet wearers are 2.5 times as likely to suffer a head injury as new-helmet wearers, so the new helmet does appear to reduce the risk of head injury', oe
- (d) **Answer: e.g. This supports the claim: standard-helmet wearers are 2.5 times as likely to suffer a head injury as new-helmet wearers, so the new helmet does appear to reduce the risk of head injury.**

Question 5

- (a) **M1** 1 divided by (24 + 1), oe
- (a) **A1** 4% cao
- (a) **Answer: 4%**
- (b) **M1** 1 divided by 12, oe
- (b) **A1** 8.3% awrt
- (b) **Answer: 8.3%**
- (c) **M1** all three risks compared on a common scale (4%, 5%, 8.3%), oe
- (c) **A1** A, B, C cao (in that order)
- (c) **Answer: A, B, C**
- (d) **B1** valid comment, e.g. odds must be converted to a common measure (such as probability or percentage) before comparing across different products, since risks are not always given in odds form, as shown by Loans B and C here, oe
- (d) **Answer: Not fully reliable in general - odds need converting to a common measure (like percentage) before comparing, since other products may be given as a percentage or fraction instead of odds, as here.**